AVIATION WEEK
A McGRAW-HILL PUBLICATION
JULY 18, 1955
50 CENTS

The Story of a coating, a gasket, a hoist cable

3 interesting new examples of Goodyear's willingness to tackle and *solve* the small — as well as the large — problems facing the Aeronautics Industry.

THE COATING Here's the coating which could prove to be your ace in the hole when it comes to protecting the vitals of your next aircraft: chloroprene rubber-based, it is self-curing—requires no heat application. Developed by Goodyear engineers, it is already safeguarding radomes and other aircraft exterior sections from the disastrous erosion of sleet, hail and rain. Its uses are almost limitless because it readily weds itself to even the smoothest surfaces, can be brushed or sprayed on — has great resistance to chemicals, including petroleum, caustics and some dilute acids—forms an effective barrier to salt-water corrosion. Also comes as a static coating to prevent static build-up.

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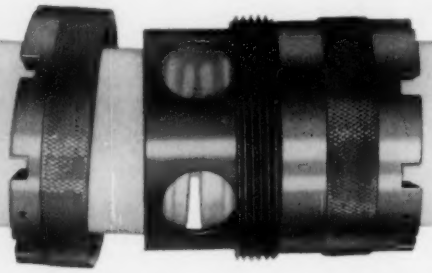

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are you interested in weight reduction?

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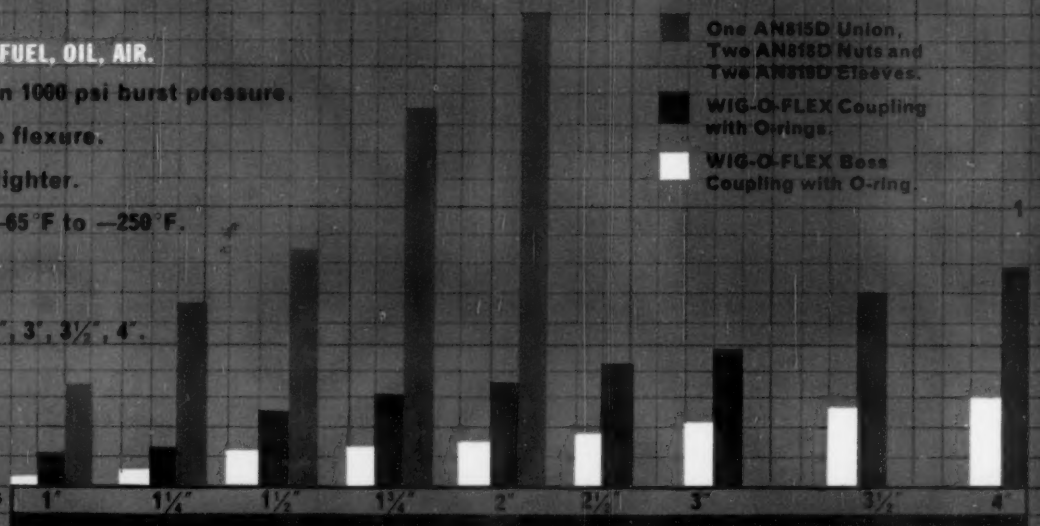

WEIGHT COMPARISON CHART

WIG-O-FLEX COUPLING & AN STANDARD FLARED TUBE CONNECTION

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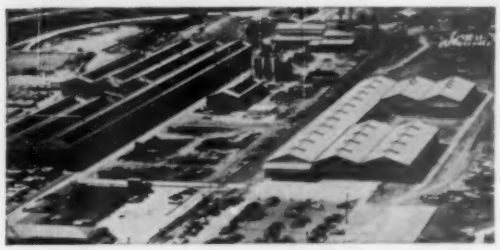

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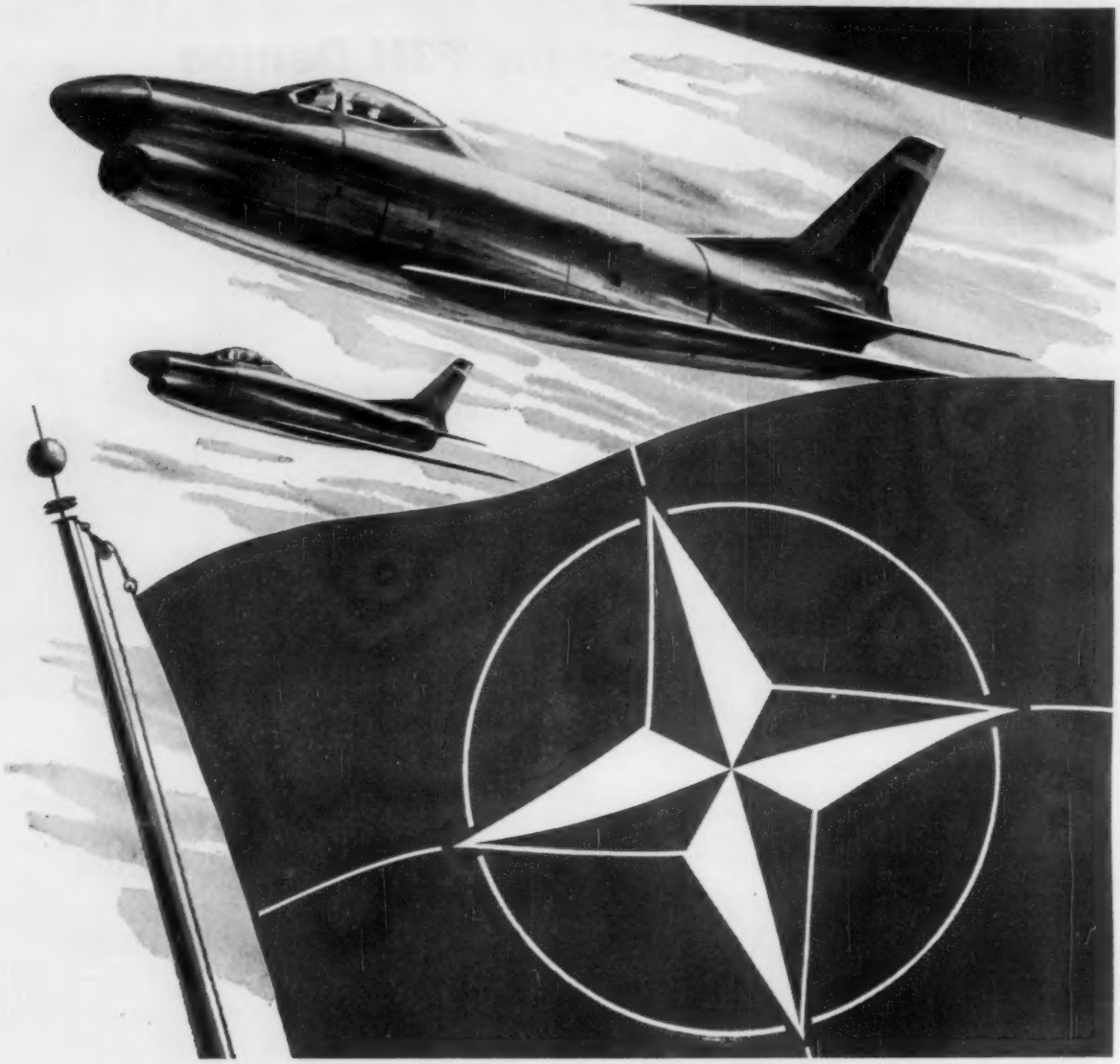

NATO's KO PUNCH

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NORTH AMERICAN AVIATION, INC.

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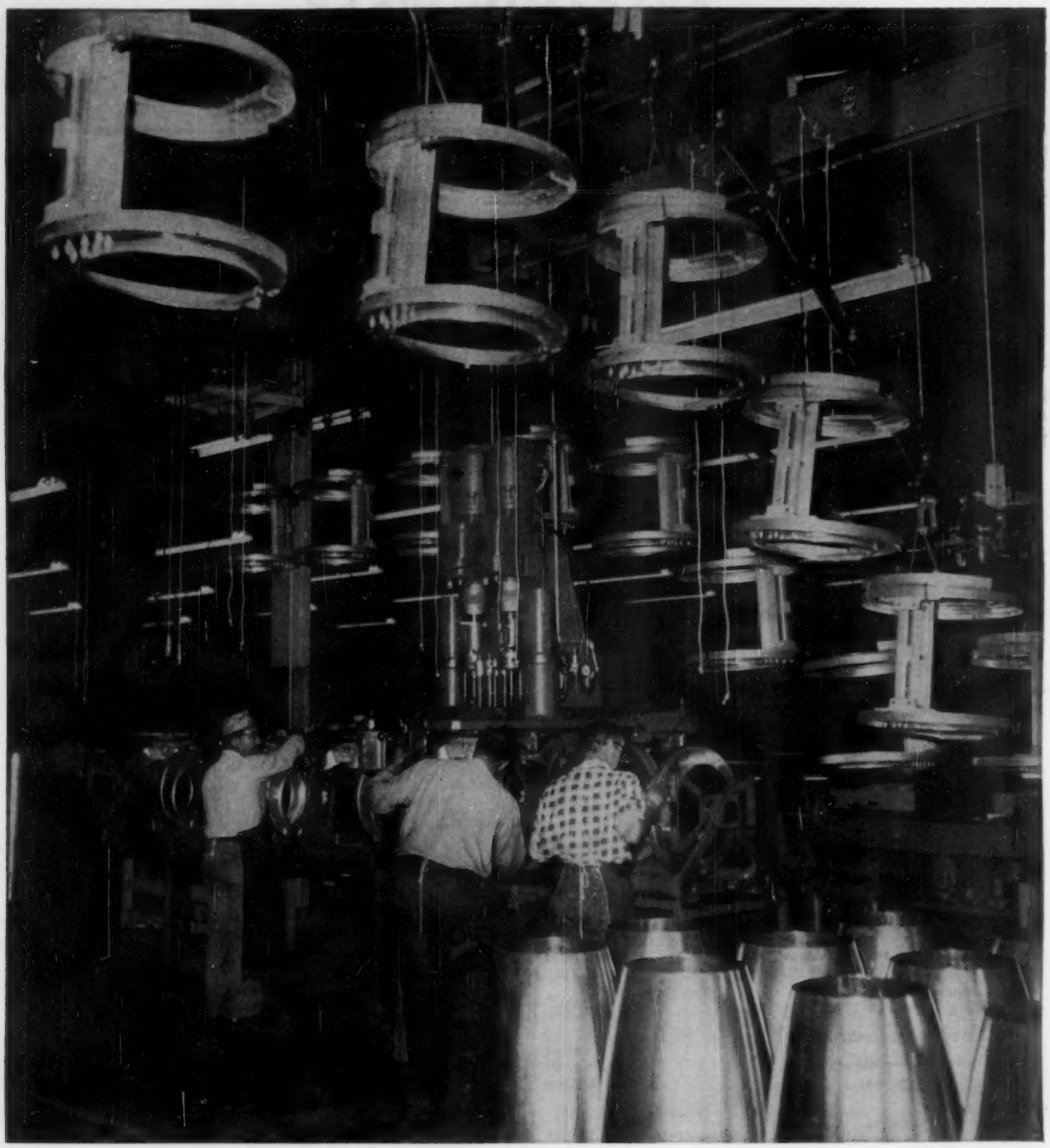

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NEWS DIGEST

Domestic

Rueben B. Robertson, 47, president of the Champion Paper and Fibre Co., Hamilton, Ohio, was nominated Deputy Secretary of Defense by President Eisenhower, succeeding Robert B. Anderson who resigned.

Maj. Gen. Albert Boyd has been assigned to the newly created position of Deputy Commander for Weapon Systems at headquarters, Air Research and Development Command, Baltimore, Md. Gen. Boyd, who commanded the Wright Air Development Center at Wright-Patterson AFB, Ohio, will supervise the planning, policies and direction of ARDC's weapon systems effort.

Bell 47G helicopter crashed over the side of the Port of New York Authority's 16-story building in midtown Manhattan July 13 when the pilot tried to take off with the auxilliary power booster cable still attached to the PNYA craft. Pilot Marcel Q. Chevalier and a passenger suffered serious injuries. The accident is expected to delay further attempts to build a commercial heliport on West Side Manhattan along the Hudson River.

Airfreight volume nearly has reached the saturation point because of today's high rates, Flying Tiger Line President Robert W. Prescott told the New York Society of Security Analysts last week. "All the airfreight carriers have developed a fine service . . . but at a price so high that only a minute percentage of the freight potential can afford to pay the rate," he said. "Where we have in the last few years recorded annual gains in airfreight volume of 25% and 50%, the present rate of gain cannot be expected to be more than 5% unless a new approach is taken on our pricing structure."

Loss of control during spin tests is blamed for the crash of a North American Aviation F-100A last week 10 miles east of Palmdale, Calif. NAA Test Pilot Robert Hoover bailed out of the USAF jet fighter at 20,000 ft. and escaped serious injury. An investigation by Air Force and company officials is underway.

Capt. R. O. D. Sullivan, 62, first pilot to make 100 trans-Atlantic flights, died July 10 at Wilmington, N. C. Sullivan retired from Pan American World Airways after his Boeing 314 crashed in Lisbon Bay, Portugal, in 1942, killing 24 of the 46 persons aboard.

First View of Lightweight Bell XH-40

Streamlined, low silhouette of new Bell XH-40 lightweight U. S. Army helicopter under development at Ft. Worth, Tex., is revealed in this initial photo of a scale model. This copter won the hottest aircraft competition in Army history early this year over seven other makers (AW Feb. 21, p. 18). Company designation is Model 212. With a payload of more than 800 lb., the XH-40 has a design cruise speed of over 100 kt. Aviation Week also reported that the craft would have a 6,000-ft. hovering ceiling and 1,500-fpm. rate of climb. Designed primarily as a frontline evacuation and instrument trainer, the XH-40 will also handle a variety of other missions. Bell's contract calls for preliminary engineering and a mockup of the craft.

Mid-air collision involving a Trans World Airlines DC-3 and a private twin-engine Cessna occurred at approximately 900 ft. near Fairfax Airport, Kansas City, July 12. The two-man DC-3 crew, on a routine training flight, said they had no warning of the Cessna's proximity. Both persons aboard the Cessna were killed. DC-3 suffered some damage to its left wing but made a normal landing.

Strategic Air Command will start an annual gunnery competition next year to select the top SAC fighter wing. Prize will be a silver trophy named in honor of the late Brig. Gen. Jesse Auton, former chief of SAC's Fighter Division, and donated by Republic Aviation Corp.

Republic Aviation Corp. and the International Association of Machinists (AFL) reached agreement on a company-paid pension plan for production employes at the Farmingdale, N. Y. plant.

Financial

Beech Aircraft Corp. declared a dividend of one-fourth share for each of 600,000 stock outstanding plus a quarterly cash payment of 30 cents, payable Aug. 24 to holders of record Aug. 1. President Mrs. A. O. Beech reported sales in excess of $59 million and net earnings of $4.65 per share for the first nine months of the current fiscal year. The backlog of aircraft orders on June 30 totaled more than $69 million.

International

Three prototypes of a new lightweight Italian fighter will be built by Aerfer of Naples for the North Atlantic Treaty Organization. The $1.3-million contract for three Arietes, developed from the sweptwing Sagittario II, will be financed jointly by the U. S. and Italy. First order probably will be followed by a contract for seven more experimental planes.

Prestwick Twin Pioneer, small transport built by Scottish Aviation for local service or airfreight operation, made its first flight. The company said its Twin Pioneer can take off at gross weight in 100 yards and land in 60 yards. Operating cost with a full load of 16 passengers on stage lengths up to 500 miles was quoted at 1.9 cents per passenger-mile. Powered by two 540-hp. Alvis Leonides 503 engines, the transport cruises at 174 mph. at 7,250 ft., climbs at 880 fpm. and has a stalling speed of 47.5 mph.

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AVIATION CALENDAR

July 27-29—Rotterdam Helicopter Congress, Rotterdam, The Netherlands.

Aug. 5-7—Experimental Aircraft Assn., third annual Fly-In and Convention, Curtiss-Wright Airport, Milwaukee.

Aug. 8-10—Institute of the Aeronautical Sciences, second National Turbine Powered Air Transportation Meeting, Olympic Hotel, Seattle.

Aug. 10-14—Air Force Assn., Convention and Airpower Panorama, San Francisco.

Aug. 15-17—Society of Automotive Engineers, West Coast Golden Anniversary Meeting, Hotel Multnomah, Portland, Ore.

Aug. 22-23—Symposium on Electronics in Automatic Production, sponsored by Stanford Research Institute and the National Industrial Conference Board, Sheraton-Palace Hotel, San Francisco.

Aug. 22-24—American Rocket Society and Northwestern University, Gas Dynamics Symposium, Evanston, Ill.

Aug. 24-26—Western Electronic Show and Convention (WESCON), Civic Auditorium and Fairmont Hotel, San Francisco.

Aug. 24-26—International Ignition Conference, conducted by Scintilla Division of Bendix Aviation Corp., Sidney, N. Y.

Sept. 3-5—Twenty-ninth National Aircraft Show, Philadelphia International Airport.

Sept. 3-9—Aircraft Owners & Pilots Assn., eighth annual Roundup Flight Cruise, New York to Bermuda.

Sept. 6-11—Society of British Aircraft Constructors, Aircraft Show and Flying Display, Farnborough, England.

Sept. 6-17—National Machine Tool Builders' Assn., Production Engineering Show and Machine Tool Show, Navy Pier and International Amphitheatre, Chicago.

Sept. 12-16—Instrument Society of America, 10th annual Conference and Exhibit, Shrine Exposition Hall and Auditorium, Los Angeles.

Sept. 17—Institute of Radio Engineers, Symposium on Automation, Cedar Rapids, Iowa.

Sept. 28-29—American Institute of Electrical Engineers and Institute of Radio Engineers, 1955, Industrial Electronics Conference, Park Sheraton Hotel, Detroit.

Oct. 3-5—Eleventh annual National Electronics Conference, Hotel Sherman, Chicago.

Oct. 4-6—Eleventh annual Aircraft Spark Plug and Ignition Conference, sponsored by Champion Spark Plug Co., Secor Hotel, Toledo, Ohio.

Oct. 5-7—National Business Aircraft Assn. eighth annual Meeting and Forum, Sheraton-Cadillac Hotel, Detroit, Mich.

Oct. 5-7—1955 National Airports Conference, sponsored by American Association of Airport Executives and University of Oklahoma, Norman, Okla.

Oct. 11-15—Society of Automotive Engineers, Golden Anniversary Aeronautic Meeting, Aircraft Production Forum and Aircraft Engineering Display, Hotel Statler, Los Angeles.

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WHO'S WHERE

In the Front Office

Sir Maurice Dean, Britain's Permanent Under Secretary of State for Air.

Charles H. Weaver, vice president in charge of all Westinghouse Electric Corp.'s atomic power activities.

Harry F. Vickers, vice chairman of the board for Vickers, Inc., Detroit. Other new officers: **Kenneth R. Herman**, president, and **Dr. N. E. Edlefson**, vice president-engineering.

V. J. Hill, Jr., vice president and general manager of Walter Kidde & Co.'s new Aviation Division, New York. New assistant vice presidents: **C. L. Griffin, A. H. Hobelmann** and **H. S. Mann.**

Samuel E. Emmons, Jr., vice president-sales and public relations for Pan-Maryland Airways, Inc.

Gordon W. Mallatratt, vice president of Rheem Manufacturing Co., New York. Mallatratt is general manager of the Rheem Products Division.

Howard E. Chilcoat, vice president-West Coast sales manager for Townsend Co., New Brighton, Pa. Other changes: **George A. Bentley**, general sales manager; **Robert E. Casner**, Central Division manager in Detroit, and **John W. Hernlund**, works manager at the New Brighton plant.

C. D. H. Webb, director of Plessey International, Ltd., Ilford, England.

Walter J. Bemb, vice president-customer relations, Aluminum Industries, Inc., Cincinnati.

Gen. Charles L. Bolte (USA Ret.), special assistant to the board chairman of ACF Industries, Inc., New York.

Honors and Elections

Hamilton O. Hale, member of the New York law firm representing Scandinavian Airlines System in the U. S., made a Knight-First Class of Norway's Royal Order of St. Olav for his contribution in helping SAS obtain its transpolar route between Los Angeles and Europe.

Changes

Chance Vought, sales director for the Aircraft Division of White Industries, Inc., subsidiary of Mack Trucks, Inc. He is the son of the late Chance Vought, Sr., founder of Chance Vought Aircraft, Inc.

Dr. E. J. Warlow-Davies, deputy chief engineer of Bristol Aeroplane Co.'s Engine Division. Also promoted: **S. S. Tresilian**, assistant chief engineer; **B. S. Massey**, assistant chief designer, and **B. D. Blackwell**, engineer-in-charge of a new department for development of turbine blades.

Ford Eastman, Eastern Region public relations representative for Northwest-Orient Airlines and manager of NWA's new Washington, D. C. office. **Phyllis Haggerty**, Northwest public relation representative in New York.

Joseph J. Jenkins, sales manager for Lincoln Engineering Co.'s Industrial Division, St. Louis.

(*Continued on page 106*)

INDUSTRY OBSERVER

► New wing for Northrop Snark long range missile features lower aspect ratio, leading-edge extensions on outer panels, and external fuel tanks just inboard of the extensions. Platform of new wing resembles that of Douglas RB-66, with filled-in portion of trailing edge near the fuselage. Original Snark wing was high aspect ratio, sharply-swept layout with uniform taper.

► **Wing curl, where the sharp leading edge of a thin wing tends to deflect upward under load, is one of the new phenomena of supersonic flight. High peak loads at the edge leading start the deflection; aerodynamic heating of the under surface forces further curl because of the uneven expansion.**

► Current plans for Wright's J67 twin-spool turbojet call for production of 20 engines.

► **Bombing data, including fuze functioning and armor penetration, is found by firing bombs from a huge air gun at the Air Force Armament Center, Eglin AFB, Fla. Gun accelerates bombs to speeds approximately free-fall and gives a controlled test set-up without resorting to costly flight missions.**

► Bell Telephone Laboratories has been given a USAF weapons systems development contract for a new bomber to meet Tactical Air Command's 1965 requirements. This is another example of USAF awarding a major air weapons systems contract outside the airframe industry.

► **Delay in Douglas F4D program may mean that the company will have to lay off 2,500 workers at its Torrance, Calif., facility. Normal attrition has been taking care of most of this but further delay may mean actual firings.**

► One of the problems with the Douglas B-66 is buffeting caused by the turret. In addition, hydraulic system feedback characteristics have amplified normal vibration to the extent of seriously affecting the flying characteristics.

► **North American Aviation has proposed two versions of the F-100 as single-place interceptors. Both would be capable of speeds well over Mach 1. An underslung air inlet is proposed for one.**

► Pratt & Whitney T57 split compressor turboprop developed from the J57 turbojet is now running on test stand at the East Hartford plant. It has not yet tackled an official 150-hour type test to determine its military rating.

► **Republic F-105 is designed for a top speed of better than Mach 2 and a maximum range of better than 2,000 miles. First F-105s will fly with a P&WA J57 turbojet but production versions are scheduled to take the J75 engine.**

► Glenn L. Martin Co. is building a tow target version of the B-57 twin jet bomber.

► **Cornell Aeronautical Laboratory conducted several hundred hours of wind tunnel test work in the development of the Chance Vought XF8U-1 supersonic Navy carrier-based fighter. Cornell did the work under contract to Vought.**

► Lockheed Chief Engineer C. L. (Kelley) Johnson gave some indication last week of what may follow the F-104. He told the Lockheed Management Club that the next step will be a hypersonic aircraft. "This is in the flight regime of Mach 4 to Mach 20," he said. "It may involve altitudes up to 400,000 ft. We're not sure that a pilot will work at that altitude—in fact, the missile people argue there is no need for a pilot in this speed range."

► **Bullpup Navy Missile project awarded to the Glenn L. Martin Co. has grown so that its designation has been changed to Bulldog.**

► Cornell Aeronautical Laboratory is contracting to run wind tunnel tests on a new French delta fighter, Sweden's double delta SAAB 210; and on an Italian Fiat fighter design.

Person to Person

Personal contact often spells the difference between success and failure in any business undertaking. The needs for on-the-spot sales presentations . . . for executive inspection of branch facilities . . . for person-to-person consultation demand the utmost from the sales and service forces and may exceed the physical capabilities of the executive team.

Over four thousand Beechcraft Bonanzas are providing a new and better method of spanning the barriers of time and distance for forward-looking companies.

The 1955 Beechcraft Model F35 Bonanza, with its high payload, high speed, low-operating cost, and rugged dependability, enables aggressive business leaders to meet the challenge of expanding markets . . . multiplies the opportunities for personal sales and service.

A cruising speed of 184 miles per hour and a range up to 1180 miles prove the Bonanza the leader in the four-place field. It pays dividends . . . brings more time for business – more time for pleasure, too! The World Is Small When You Fly A BEECHCRAFT.

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BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS

Washington Roundup

Fiscal 1957 Budget Plans

With the ink scarcely dry on congressional approval of the $31.8 billion Fiscal 1956 defense budget, top level White House, Treasury and Pentagon planners are beginning consideration of the Fiscal 1957 budget. Despite publicly expressed hopes for disarmament on nuclear and hydrogen weapons as a result of the "summit" talks in Geneva, the Administration is not counting on it in its Fiscal 1957 defense budget planning. Plans for a $5 billion cut for next year's defense bill have been abandoned as a result of the rapid growth of Russian airpower, particularly its jet bomber fleet capable of delivering hydrogen weapons. Preliminary planning for Fiscal 1957 now centers on the issue of whether the defense budget can be safely held at the 1956 level or whether a $2 to $4 billion increase will be necessary to expand and accelerate growth of defensive and offensive airpower to keep ahead of the Russian challenge.

British Transport Worries

Growing threat of American competition in the commercial jet transport market is beginning to worry the British aircraft industry whose reputation in this field was badly shaken by the Comet disasters. British trade publications are beginning a propaganda barrage against the Douglas DC-8 and Lockheed Electra on the grounds that no suitable American jet engines are available for these planes and that they are fitted only for U. S. domestic airline operations and will not fit the European route patterns. Fact is that both the Pratt & Whitney turbojet scheduled for the DC-8 and the Allison turboprop scheduled for the Electra will have far more operational service by the time these commercial airliners are delivered than any British engine in either class. Current British visit of American Airlines President C. R. Smith and Robert Gross, president of Lockheed, is purely to "needle" General Motors Corp. top management to support the Allison Division commercial program on the Model 501 turboprop engine.

Subsidizing British Aircraft

Congressional opposition to subsidizing British aircraft manufacturing companies figured again this year in House debate on the $2.6 billion appropriation for foreign aid. An amendment banning use of any part of $705 million military assistance for aid to British manufacturers missed adoption on a 91 to 92 vote. Rep. Alvin Bentley (R.-Mich.), author of the amendment, reported that about $100 million of the $705 million is for subsidization of British aircraft manufacturers "so that they can come over here and conclude contracts with some of our commercial airline companies for the use of commercial jet transportation instead of buying American transports."

Tax Amortization Study

Awards to aircraft and airline companies probably will be examined in the "continuing study" of the accelerated tax amortization program of the House Government Operations Subcommittee headed by Rep. Robert Mollohan (D.-W. Va.). The subcommittee is launching the study with hearings on awards to railroads, but has no definite plans beyond this. Members point out that the purpose of granting rapid tax amortization benefits is expansion of the industrial base and object that railroads have used it for replacement facilities.

Air Agreement Probe

Provoked by the recent German bilateral agreement granting lush routes to Lufthansa in the western hemisphere, (see page 18) Senate's Commerce Committee is launching "a full-scale investigation into the negotiation and signing of international air route agreements by the State Department and the Civil Aeronautics Board. It will be made by a special subcommittee headed by Sen. George Smathers (D.-Fla.) and including Sen. Alan Bible (D.-Nev.) and Sen. John Bricker (R.-Ohio).

On appointing the special subcommittee, Commerce Committee's chairman, Sen. Warren Magnuson (D.-Wash.), commented:

"Our committee has no desire to interfere with the affairs of the State Department and the CAB. But when our airlines are so patently discriminated against I feel that it is time for our committee to find out what is behind the reasoning of the government officials who accord them that sort of treatment."

Jackson vs. Wilson

Defense Secretary Charles Wilson declined a second time to make written answers—on a "closed door" basis—to 12 specific questions on the relative position of U. S. and Russian air power in the latest round with Sen. Henry Jackson (D.-Wash.) over whether or not he should answer the questions (AW July 11, p. 17). A step-by-step account so far:

- In response to Jackson's request for answers, Wilson replied that they would have to be answered in executive session and added that "full information" has already been presented to "the appropriate committees of Congress including several of which you are a member."
- Jackson replied that most of the information involved is already public, but requested Wilson to submit written replies for executive consideration by the Military Applications Subcommittee on Atomic Energy, of which he is chairman;
- Wilson declined to submit answers in written form. Jackson doesn't plan to drop the matter.

USAF Counterpoint

Air Force activation of the 19th Air Force at Foster AFB, Tex., is the latest move to halt expansion of aviation at the Army expense of USAF.

USAF said that Foster AFB was selected for the headquarters because of the major training role its units will have with Army forces located in close proximity.

CAB Candidates

Most likely candidate for appointment to the next vacancy on the Civil Aeronautics Board is Wingate H. Lucas, 47, former Democratic congressmen from Texas. Lucas is expected to be named as a replacement for two-termer Josh Lee whose membership expires at the end of the year. Lee, a former Democratic senator from Oklahoma, has been counted out for re-appointment since Ross Rizley became the second Oklahoman on the Board last February.

—Washington staff

AVIATION WEEK VOL. 63, NO. 3
JULY 18, 1955

USAF Expands Basic Research Program

Closer liaison with science, industry is mission of Office of Scientific Research; Flickinger commands.

By Robert Hotz

Baltimore, Md.—Air Force is increasing its basic research effort aimed at achieving major scientific breakthroughs for development of radically new aerial weapons.

This program had been proposed by Air Research and Development Command for some time, but was only recently approved at Defense Department level. The accelerated basic research program will be organized and operated by an expanded Office of Scientific Research headed by Brig. Gen. Don Flickinger, currently director of research for ARDC.

The Office of Scientific Research will be elevated within ARDC to where it reports directly to Lt. Gen. Thomas Power, ARDC commander, and will shift its operations to Washington D. C., as soon as possible. The shift to Washington is aimed at providing close liaison with the National Advisory Committee for Aeronautics, Office of Naval Research, National Science Foundation, the Air Staff and Defense Department scientific panels.

Operation Plan

Office of Scientific Research will nearly double its $7 million budget during Fiscal 1956 with further increase planned for Fiscal 1957.

The new Office of Scientific research will have two basic missions:

- **Develop and expand** a scientific potential in fields bearing on USAF problems.
- **Establish and maintain** contact with the scientific community to keep USAF informed on all new discoveries in basic research so that they can be applied to air weapons development.

OSR will continue its research contract operations with industry, universities and individual scientists on an expanded basis with particular emphasis on the following areas:

- **High temperatures.**
- **Hypersonics.**
- **Propulsion methods and fuels.**
- **Solid state physics.**

It will expand its present Pasadena field office to maintain contact with the West Coast aircraft industry and scientific community and also use the facilities of ARDC's Brussels office to tap the scientific reservoir of Western Europe.

Although OSR will operate under the command of Gen. Flickinger, with Col. William O. Davis as deputy commander, close coordination with the scientific community will be assured by a civilian chief scientist and four civilian directors in each of the following fields:

- **Aerodynamics.**
- **Materials.**
- **Life sciences.**
- **Physical sciences.**

OSR plans three specific methods of stimulating better communications between USAF, industry and university research groups and currently has a task force studying the problem of getting better liaison between USAF and industry at the research level.

Symposium Plan

OSR plans to sponsor symposiums on critical subjects such as hypersonics, combustion instability and other areas in which USAF is encountering technical stumbling blocks.

These symposiums will feature panel discussions with no formal papers. They will be attended by a mixture of military, industry and university scientists and wherever possible will be aimed at "cross-pollinating" between basic fields such as the mixing of aerodynamicists and physicists on the problems of hypersonics.

Science days will also be organized at specific ARDC centers on the problems bearing on each center's work. These days will feature an industry-university mixture that will tour each ARDC center, get a briefing on its mission and problems and contribute suggestions for better scientific support of the center's activities.

The work of OSR is not aimed at producing immediate results in aerial weapons hardware development. It is aimed at providing the fundamental scientific knowledge that will enable USAF to

OSR Mission

The mission of the Air Force Office of Scientific Research is to insure that the strategic scientific potential of the United States in support of air technology is developed and maintained at all times in a state superior to that of the enemies of the United States and its allies. In addition, the USAF Office of Scientific Research must establish and maintain contact with the scientific community of the free world in such a manner that the existence of a new scientific capability will be immediately known and its implications recognized with regard to new strategic concepts or the improvement of existing weapon systems.

Brig. Gen. Don Flickinger, 48, is one of USAF's experts on aero-medicine and a pioneer in developing human factors research to improve efficiency of combat crews. Graduate of Stanford University Medical School, Flickinger took postgraduate medical work at Harvard and Vanderbilt Universities before joining the Air Force in 1937 as a flight surgeon. His contributions in human factors field began with B-17 crews in 1941 and continued through the B-36 and B-52 operations. He was awarded the Legion of Merit, Soldiers Medal, Bronze Star and Air Medal for his hazardous air rescue operations on the India-China Hump during World War II during which he made many parachute jumps heading medical teams to assist bomber and transport crews that crashed in this Asiatic wilderness. He has been with Air Research and Development Command since 1951 as its first director of human factors, and has been director of research for ARDC since 1954.

continue a rapid pace of weapons improvement during the next five to 15 years. Without a great expanded and advanced base of fundamental scientific knowledge as a foundation for weapons development, top USAF leaders feel they will not be able to maintain technical superiority over potential enemy competition.

$15 Billion Available For Military Planes

Air Force and Navy now have approximately $15 billion available for new aircraft and related procurement contracts. Here is the fund situation:

• **Fiscal 1956 budget** provided $7.2 billion in new money: $6.3 billion for USAF and $906 million for Navy.

• **Unobligated balance** on hand, as of June 1, totaled $7.7 billion. This was divided: USAF, $5.3 billion; Navy, $2.4 billion.

New money and the unobligated funds for aircraft procurement totals $14.9 billion.

During May, obligations totaled $345 million: USAF, $344 million; Navy, $1 million. At this rate, it would take 43 months, or more than three and a half years for the services to obligate the $14.9 billion.

Obligations for eleven months of Fiscal 1955 totaled about $4.2 billion: USAF, $4.1 billion; Navy, $729 million.

Expenditures for the 11-month period totaled $7.9 billion, compared with $8.3 billion for the same Fiscal 1954 period. On June 1, the two services had unexpended balance for aircraft and related procurement of $19 billion: USAF, $12.5 billion; Navy $6.6 billion.

USAF Shows Airlift Capability In Moving Regiment to Japan

By Claude Witze

Tokyo—First half of Operation Gyroscope, largest and longest air troop movement in history, was completed 3 hours ahead of schedule.

The air lift switch between Ft. Campbell, Ky., and Japan involved carrying about 3,900 soldiers to Japan; the 43 Douglas C-124C Globemasters engaged in the operation immediately started loading 3,130 other paratroopers in Japan for the long return flight to Kentucky.

This exchange of paratroopers—the 508th Regimental Combat Team replacing the 187th—is the first test of large scale air movement to demonstrate three significant developments:

• **Ability of the Army** to cover potential danger spots anywhere in the world with the shortest and fastest pipeline. The 508th was moved here, ready for action, in a 9,000 mile long stream of C-124's, one every two hours, day and night, for 3½ days.

• **Ability of the U. S. Air Force** to schedule and maintain the operation. In the round trip of 18,000 miles, the 18th AF will fly more than 63 million passenger-miles. Details in scheduling and keeping the troops moving regardless of weather and mechanical failure required cooperation from all USAF stations along the line of flight.

• **Recognition** that this type of fast and efficient troop movement, adequately demonstrated, will serve as a deterrent to potential aggressors. Col. Norman E. Tipton, commanding officer of the 508th, told AVIATION WEEK he is confident that the story of the Korean war would have to be rewritten if this 10-day exhibition air-lift troop rotation had been started before 1950.

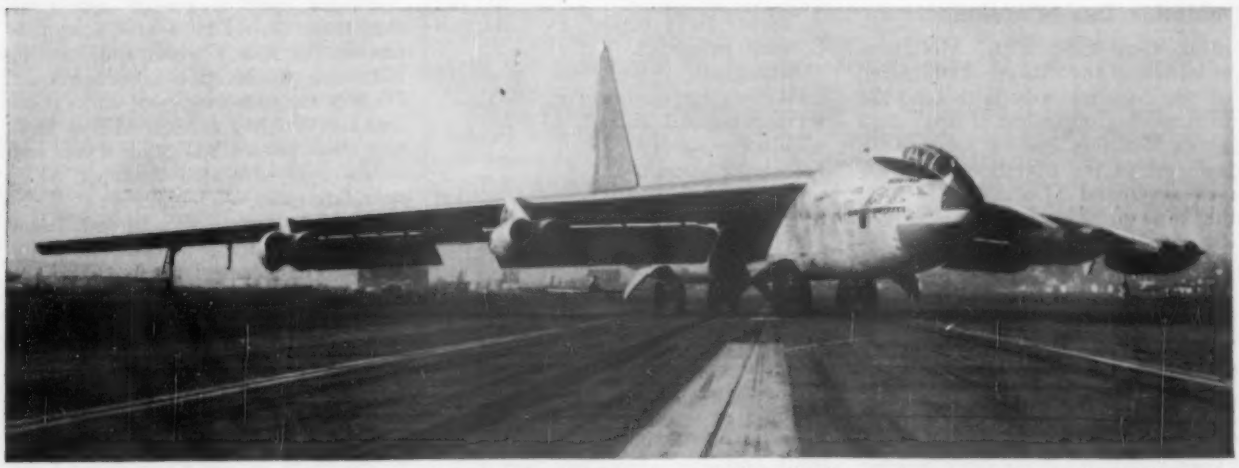
Maintenance Arrangements

For Operation Gyroscope, the big C-124's were stripped of excess weight at their home field, Donaldson AFB, S. C. Nose ramps have been removed and other equipment taken out to cut the weight of each plane by more than two tons. Installed for the trip are five 20-man life rafts, two 6-man rafts, 100 Mae West life preservers, three radio-equipped lift rafts and four URC-4 radios, plus emergency rations and drinking water.

Load for each aircraft is 90 paratroopers, each with his weapon and personal gear, and seven tons of baggage. Authorized gross weight for takeoff is 185,000 lb. About 23,000 of this is personnel and equipment and 35,000 to 40,000 lb. is fuel.

Advance preparation included the positioning of 500 mechanics and support personnel along the line of flight. These stations include Ft. Campbell, Ky.; Travis AFB, Calif.; Hickman AFB, Hawaii; Wake Island and two stations in Japan—Ashiya and Itazuke—from where the 187th RCT takes off for its home base.

They are flown to Mackall Army



Crosswind Gear Standard on B-52

Crosswind landing gear is standard production equipment on the Boeing B-52 Stratofortress, Boeing Airplane Co. has announced, confirming Aviation Week's report May 16, p. 9. This photo shows the XB-52 taxiing with this landing gear at Boeing Field, Seattle, Wash., against a crosswind. All four dual-wheel trucks swivel. The B-52's landing gear was developed by Boeing and is produced by Cleveland Pneumatic Tool Co. and Bendix Aviation Corp. Boeing says that the installation is the first use of crosswind landing gear on a production jet plane, on any production military plane and on any bomber. The company initially tested its gears on a B-47 Stratojet in 1952 at Wichita, Kansas, Division.

Boeing Gets Commercial Jet Go-Ahead

Boeing Airplane Co. won permission from the Air Force last week to produce a commercial Model 707 jet transport concurrent with production of the KC-135 jet tanker.

"The Boeing Company will now take immediate steps to negotiate firm contracts with the commercial airlines," William M. Allen, Boeing president, said. "We have indicated to the airlines that we could deliver aircraft on a basis which would permit start of scheduled operations early in 1959." Douglas Aircraft has stated that deliveries of its DC-8 jet transport will begin in 1959 (AW June 13, p. 13).

The Air Force said that previously it had denied Boeing's request to manufacture a commercial transport version. USAF added that it is now satisfied that such commercial production will not interfere with nor delay scheduled delivery of jet tankers.

Allen said that Boeing has made proposals to a number of domestic and overseas operators, contingent on Air Force approval for the company to enter commercial production.

"We have worked closely with the airlines since the inception of the jet transport project in 1950," Allen said. "The 707 prototype and the commercial jet Stratoliner evolved from it embrace many of the ideas developed in our consultations with the operators."

The 767 jet Stratoliner will be a four-jet, swept-wing aircraft of 80 to 135 passenger capacity. Its speed, Boeing said, will be in the 550 mph. range and it will be capable of nonstop transcontinental and transocean operation. Its gross weight will be greater than the 707 prototype, but less than the KC-135 jet tanker. The 707 prototype now has almost 200 hours of flight test time, Boeing reported.

Airfield, near Ft. Bragg, N. C.

At Travis AFB there are 56 maintenance men, enroute repair kits and two spare engines. At Hickman AFB, Hawaii, headquarters of Col. Wade Hampton, the airlift mission commander, there are 130 maintenance mechanics, four spare engines and five spare aircraft. The fact that Military Air Transport Service operates from these fields is of limited help in the maintenance problem because MATS does not fly the C-142C.

Evaluation Due in Month

Maj. Gen. Chester E. McCarthy, commander of the 18th AF, emphasized that the essential effort is to keep the troops moving, regardless of equipment failures. To this end, a total of 56 planes are in the operation, 43 flying at all times and 13 standing by. Another nine aircraft are under alert, but Gen. McCarthy does not expect to need them.

Like the engines and planes, flying crews have been prepositioned. Total flying time one way is set at 43 hours, roughly in 10-hour jumps. Crews are changed after each leg of the flight. They get a 14-hour rest before taking another load to the next point.

Final evaluation of the airlift will not be known for more than a month. Col. Theodore G. Kershaw, 18th AF chief of staff, has ordered a final report on the mission within 20 days after it is complete.

This will show the consumption of materiel and make recommendations.

Lockheed Pushes 1049 Over Jets, Turboprops

Burbank, Calif.—Lockheed Aircraft Corp. plans to continue production of its Super Constellation series for "several more years." The company believes advanced piston-engined transports still will be needed in 1956 because turboprop and turbojet aircraft are years away from quantity production.

The forecast was made last week by Burt C. Monesmith, Lockheed vice president, in a report to California Division personnel.

Monesmith gave this predicted breakdown for air travel in 1965:

- **Piston-engined aircraft, 65%.**
- **Turboprop aircraft, 34%.**
- **Turbojet aircraft, 1%.**

He reported that Lockheed market research statistics indicate world air travel will double in the next 10 years, jumping from an expected 36 billion revenue passenger-miles this year to approximately 72 billion in 1965.

"Every indication is that more piston transports will be needed by the '60s because turbine types cannot be produced fast enough to absorb all the increasing passenger volume," Monesmith said.

"This is why Lockheed is pushing development of its regular model 1049G and latest model 1649 Super Constellations even while the all-new medium-range turboprop Electra is being readied." First flight of the 1649 is scheduled for Oct. 1 of next year.

Lockheed engineers have shifted to a 45-hour week to meet the first flight date of the 1649, Monesmith said. Stepped-up sales campaigns have been instituted for both the 1049G and the cargo 1049H as well as the 1649.

Engineers are using two separate mockups in order to speed 1649 production. The 150-ft. wing is being mocked up as one unit while a fuselage is being refitted as another.

Lockheed also is using what it calls a "teamwork" plan, in which flight test engineers are working side-by-side with design engineers in the early design stage. The company said this will enable flight test instruments to be installed on the assembly line rather than in production refitting.

Meanwhile, the company disclosed that work was begun on a full-size engineering mockup of the turboprop Electra. This mockup will be ready for demonstration to American Airlines in September, with final completion scheduled for next January.

USAF Construction Funds Reduced

Washington, D. C.—House Appropriations Committee cut off funds for construction of the Air Force Academy and in headquarters building for USAF's Research and Development Command, both controversial projects.

The committee's decision is subject to change on the House floor and by the Senate.

USAF asked $79.5 million for the academy and $6 million for the headquarters building. The ultra-modernistic architecture planned for the academy provoked widespread criticism. Although there is general agreement that there should be a new headquarters for the R & D command, now in Baltimore, the location is controversial. USAF's top command now wants it located at Wright-Patterson AFB at Dayton, Ohio, but a USAF study a year and a half ago advocated Andrews AFB, near Baltimore.

The committee also turned down $11.5 million for a new USAF weapons proving center to be based in southwest Florida "because sufficient facilities of this type are already being developed and operated by the three services."

The $2,273 million requested in new money and authority to transfer unused funds for Fiscal 1956 construction by the three services was reduced $393 million by the committee. The $1,880 million approved was allocated:

USAF, $956 million; Navy, $440 million; Army, $484 million.

The $393 million cut was applied: USAF, $244 million; Navy, $88 million; Army, $61 million.

Frank Piasecki Starts New Firm But Plans to Keep Hand in Old

By Gordon Conley

Frank N. Piasecki plans to keep an active hand in Piasecki Helicopter Corp. despite apparently irreconcilable differences with the group that ousted him as board chairman of the company last May (AW May 9, p. 16).

The pioneer helicopter designer and founder of PHC does not expect to try to retake control of the Morton, Pa., firm in the foreseeable future. Instead he will concentrate on developing his new organization Piasecki Aircraft Corp.

Rebuffed Offer

Piasecki outlined his plans last week after predictions within the aircraft industry that he would break completely with his old firm. Speculation started after he rebuffed an offer by PHC management to give Piasecki Aircraft a contract for research and development. It was strengthened by these other developments:

• **Don Berlin,** president and board chairman of the helicopter builder, called a press conference for July 18 in New York to "answer questions regarding recent developments at and the outlook for Piasecki Helicopter Corp."

• **Three PHC executives** resigned to join Piasecki Aircraft as members of the board. They were Donald N. Myers, director of the older firm's Research and Development Division, one of the original group that founded the copter company and still a board member; Eliot Daland, designer of the first successful rigid rotor and cyclic control and also a member of the founding group; and Edward G. Vanderlip, avionics specialist who developed the first successful automatic pilot for helicopters.

• **Sources within Piasecki** said "Frank is definitely leaving."

"I turned down the contract because it encompassed too great an area," Piasecki told AVIATION WEEK. "It would have limited the growth of my new company. But I may take contracts later on with PHC to do specific jobs.

"I'm still very active and very interested in the helicopter company. I don't have a new bid for retaking control of it in my sights now, because I'm mainly concerned with developing PAC."

Piasecki will retain his membership on PHC's board of directors and its executive committee. He and his Piasecki Aircraft associates hold 25% of the stock in the older company. "While we may not have enough to control PHC," said a spokesman for the copter designer, "they still have to listen to what we have to say."

Unhealed Breach

Piasecki formed his new aircraft company in the Philadelphia metropolitan area after efforts by him and members of Berlin group failed to heal the split.

He commented only that the breach involved fundamental differences in policy. But a spokesman said the veteran copter designer had wanted more money for research and development and for commercial applications. "The basis of the whole thing was a matter of genuine disagreement on how to conduct the affairs of PHC," he said. "It could not be reconciled then and apparently never will be."

At Morton, a company spokesman said a majority of the directors "wanted Piasecki in a position of less administrative responsibility but still recognized his technical talent" when they removed him as board chairman.

Vertical Lift Fields

In Philadelphia, Piasecki has set up headquarters for his new aircraft firm and now is looking for a plant site. The company is capitalized with 300,000 shares of stock, the price of which has not been established.

He said Piasecki Aircraft would not compete with his old corporation but planned to concentrate on these three fields:

• **Military vertical flight aircraft.** "We shall offer our services to the U. S. government for research and development of advanced types of vertical flight aircraft for specific military tasks.

"We are ready to put up our own funds to initiate the solutions to some of the urgent problems of defense requiring aggressive research and development into new fields. In this way, we feel we can accelerate the development of advanced military equipment desired by our government."

• **Vertical takeoff and landing aircraft.** "We shall enter into agreements in the international field for the licensing and production of VTOL aircraft and their components to strengthen the Free World production of such aircraft for both military and civilian use."

• **Accessories and equipment.** "It is our desire to aim at product programs having broadest applications, including eventual industrial, commercial and civilian potential in order that the sales can form the largest and most continuous market."

Piasecki reported he completed tentative agreements with several foreign companies when he was at the 21st Salon de l'Aeronautique in Paris.

He said the company's aircraft work in military, commercial and foreign fields would include building and testing new vertical-lift prototypes. Some of these will be for industrial and agricultural applications.

Bell Honored, Celebrates Anniversary

Aeronautics is going through a near total revolution that will produce 7,000 to 10,000 mph. aircraft within the next 20 years, Lawrence D. Bell stated at the 20th anniversary celebration of Bell Aircraft Corp., the company he founded and heads as president.

"As an indication of the revolution now going on in aeronautics," he said, "the industry is already working on such radical principles as vertical rising aircraft, completely automatic controls, nuclear fuels, electronic all-weather guidances. . . .

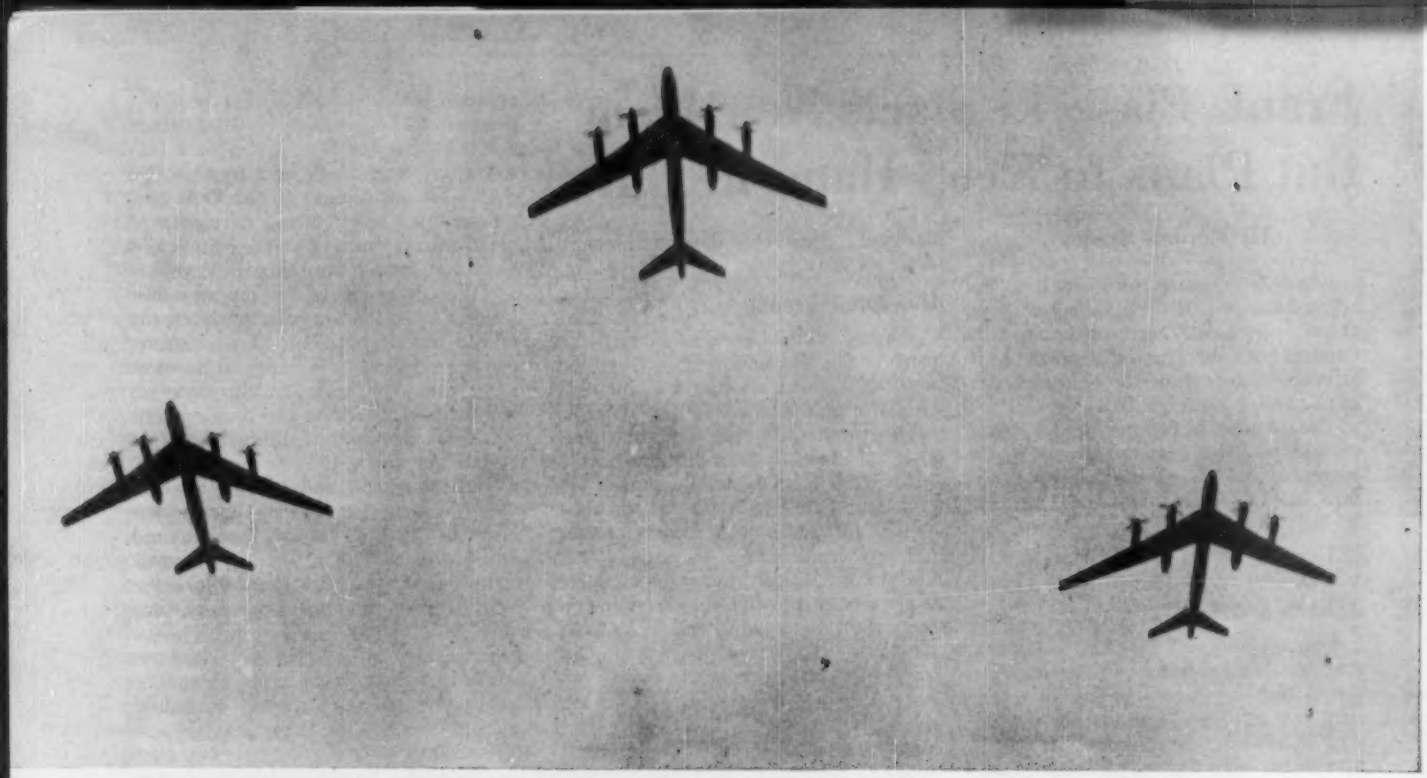
"We will conceive and build vehicles with speed ranges of between Mach 10 and Mach 20 (approximately 7,000 to 14,000 mph.) and the ability to operate at altitudes up to 50 miles. And this we will do in the next two decades."

Bell was presented the Exceptional Service Award, USAF's highest civilian honor, by Roger Lewis, Assistant Secretary for Materiel. The "notable achievements" by Bell's company cited by the Air Force included many firsts: the P-59 Airacomet, first American jet; the X-1, first rocket propelled supersonic airplane; the HSL-1, the first anti-submarine helicopter; the X-1A, first aircraft to exceed twice the speed of sound; the first jet-propelled VTOL aircraft; and the GAM-63, the first long range, air launched, rocket propelled guided missile.

Noting that the Wright brothers made the first big step in aviation—proving that man need not be earthbound, Bell said the next step is to prove man can operate outside the atmosphere and "the third will follow when we can operate outside of the gravity field of the earth." Much solid thinking has already gone into these phases, he added.

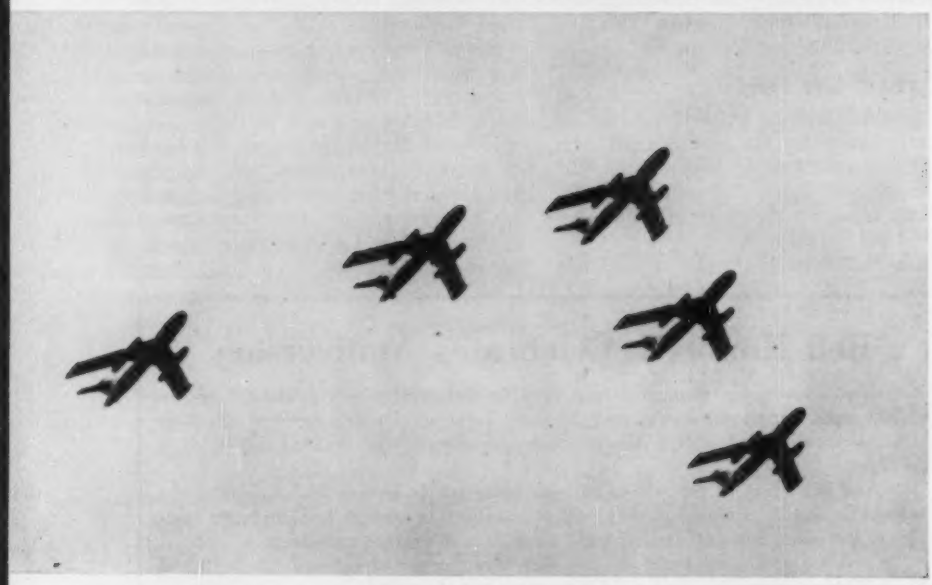
Having licked the sonic barrier, "we are faced with the thermal barrier now," he stated. "And when that is licked, there probably will be a couple of more to contend with, perhaps radiation barrier and maybe even the time barrier."

"Yes, after 53 years, aviation is just beginning," he concluded.



RUSSIAN BEARS: four-turboprop bombers over Tushino airport July 3. Cranked wing has less sweep outboard; nacelles are far out on the wing. Engines swing counter-rotating props. Nacelle extensions may house landing gear.

Soviets Show New Airpower Over Moscow



FOR DEFENSE: five all-weather fighters from a 50-plane formation. Layout resembles German ME-262, is believed obsolescent. Note huge radome and extremely small diameter of underslung jets.

MASS OF MILS: Type 36, Hound helicopters designed by Mikhail Mil, demonstrate at Tushino. Resemblance to Sikorsky S-55 is marked, but rotor has four tapered blades.

Airlines Protest Added Gas Tax

Washington, D. C.—Airlines faced the prospect of increased airport user fees and gasoline taxes as Congress rushed toward adjournment.

• **Legislation authorizing** a multi-billion dollar highway program provided for an increase in the gasoline tax from two to three cents a gallon to offset the cost. "As applied to non-highway users, we regard this tax increase as unfair and inequitable," Stuart Tipton, general counsel of Air Transport Assn., told the House Public Works Committee.

• **In approving $2.6 million** to increase the capacity at the congested Washington National Airport, House Appropriations Committee directed Civil Aeronautics Administration to "take immediate steps to increase all fees, especially landing fees, to the maximum allowed under contracts in effect with the airlines." The committee said: "The airlines using the Washington terminal are not paying adequate fees to cover the cost of maintaining and operating its facilities." The group added that fees at Washington National "should be increased to the levels in effect at the major airports serving New York City as soon as possible."

A report by CAA showed that landing fees at locally-operated LaGuardia Airport in some instances are three times as high as at Washington National (see box).

With the $2.6 million plan for new facilities, according to CAA Administrator Fred Lee, "we will just about reach the limit" of increasing capacity at the Washington terminal. The plan calls for: A new cargo building and a new finger building, expansion of baggage space, standardization of field marking, high-speed taxiway development, expansion of runup aprons, the fueling system, and aircraft parking.

The question of a second terminal to handle Washington traffic was raised at appropriations committee hearings. But a move, led by Rep. Dan Flood (D.-Pa.) to add $10 million for this failed.

CAA now owns approximately 1,000 acres, a $850,000 investment, near Burke, Va., originally intended for the second airport. Opposition of local residents and Maryland interests wanting Baltimore's Friendship Airport as the alternative have blocked the project.

A CAA report gave this picture of traffic at Washington National:

• **Number of enplaned passengers** mounted from 1.2 million in 1946 to an estimated 3.4 million for 1955.

• **Number by 1960** will reach 4.8 million, or 1.4 million more than in 1955.

• **Number of aircraft movements** at the airport increased from 180,690 (105,167 scheduled airline) in 1946 to an estimated 212,000 (178,000 scheduled airline) for 1955. By 1960, the number of movements is expected to reach 273,700 (240,000 scheduled airline).

The Administration has taken the position that the initiative regarding a second airport should come from local interests or governments. Lee reported that "meetings have been held with representatives of the District of Columbia, of certain parts of Virginia, and of certain parts of Maryland."

Tipton estimated that the increase in the gasoline tax from two to three cents would boost the scheduled airlines' annual bill by about $10 million.

"If this additional tax had been in effect during the year 1954, it would have taken from 6 to 36% of the entire net profit of the airlines subject to the tax," Tipton protested. "It would have taken 17.5% of the modest profits earned by local service airlines . . ."

Tipton gave these comparisons of what the airlines' tax will be at the two-cent level and what it would be at the three cent level (in parenthesis):

1955, $18.1 million ($27.2 million); 1956, $20.6 million ($30.9 million); 1957, $22.7 million ($34 million); 1958, $26 million ($39 million); 1959, $29.2 million ($43.8 million).

Landing Fee Comparison

Landing fees are substantially less at Washington National Airport than New York's LaGuardia Field, according to Civil Aeronautics Administration.

The criteria:

LaGuardia: Two cents per 100 lbs. maximum gross takeoff weight, with $2 minimum.

Washington National: Fixed charges by type of aircraft, with discounts for landing volume in excess of 299 landings per month.

For Each Revenue Trip Arrival	Washington National	LaGuardia
Lockheed Lodestar, DC-3, Super DC-3	2.00	$3.50– 6.20
Martin 2-0-2, 4-0-4 or Convair 240	3.50	8.00– 9.00
Douglas DC-4	5.50	12.40–14.60
Lockheed Constellation or DC-6	7.00	16.00–21.40
Boeing 377	8.50	24.34
DC-6B	7.25	20.00–21.40
Super Constellation	7.75	26.60
Convair 340	3.75	9.40
DC-7	7.50	22.92–24.44

← **Tushino crowd:** Part of the huge audience at Moscow's Tushino airport for Soviet aviation day demonstrations on July 3.

State Signs German Bilateral Despite U. S. Carrier Objections

Washington, D. C.—The bilateral air transport agreement between the United States and West Germany has been signed over the protest of Congress and several U. S. airlines.

After re-examination of the disputed document, the State Department and Civil Aeronautics Board announced that, "In consideration of all aspects of the national interest," the agreement should be signed without change.

The agreement between the two countries follows the principles established in the Bermuda agreement between the United States and the United Kingdom in 1946. The route annex to the agreement gives German airlines the following routes:

- **West Germany to Boston, New York and Philadelphia.**
- **Beyond these points to the Caribbean Sea and to South America.**
- **West Germany to Chicago.**
- **West Germany to either Los Angeles or San Francisco.**

One of the West Coast points will be chosen by the Germans later as a terminal for trans-polar service.

In return, American airlines—Trans World Airlines and Pan American World Airways—got routes from the United States to:

- **Hamburg, and beyond to points in Europe north and east of West Germany.**
- **Dusseldorf-Cologne/Bonn, Frankfurt, Stuttgart and Munich, and beyond to points in Europe east and southeast of West Germany.**
- **Frankfurt, and beyond to points in Europe south and southeast of West Germany and beyond to North Africa, the Near East and beyond.**

Both American and German airlines have the right to make traffic stops at intermediate points between the two countries.

The agreement was negotiated a month ago, but signing was postponed when U. S. airlines raised strong protests and the Senate Interstate and Foreign Commerce Committee called emergency hearings in Washington to examine the agreement on its negotiation.

Latin Routes Key

The chief point of contention for American carriers was the extensive package of rights beyond New York, Philadelphia and Boston to Latin America given the German airlines. The U. S. airlines claimed they hadn't received a proper hearing on the issue from CAB and State.

The CAB agreed to meet with the airlines to receive additional evidence on the situation. Subsequently, the CAB and State decided to go ahead with the agreement as it was originally negotiated.

Signing of the agreement drew comment from Senator Warren G. Magnuson (D.-Wash.) whose Senate committee investigated the negotiations. He observed that contentions of CAB and State that full consideration had been given the views of American airlines was contrary to testimony of airline representatives.

Senator's Attack

A strong view was expressed by Senator George A. Smathers (D.-Fla.) who called the agreement "a thoughtless and completely unjustified give-away on the part of the State Department." Smathers pointed out that the United States has spent billions of dollars on rehabilitation of Germany, and he feels it is unnecessary to grant the Germans rights between Germany and New York, then give them "and beyond" rights to Latin America without limitation.

Senator Smathers said that competition of the German airline with Eastern Airlines, National Airlines, Pan American World Airways, Braniff Airways and others "will mean that the American public will have to make up the loss to our own domestic airlines through subsidy by this unwarranted grant."

According to Smathers, many Latin American countries have been denied entry to New York. "This agreement," he said "is being signed contrary to the expressed opinions of the majority of the members of the Senate Interstate and Foreign Commerce Committee, and will result only in great irritation and confusion for our Latin American neighbors and other countries with whom we have not been so generous, and a financial loss to our American airlines—and ultimately the American taxpayer."

Commercial Jet Test

Pratt & Whitney Aircraft expects to begin commercial service with its JT3L certificated version of the J57 turbojet at a major overhaul interval of 500 hr. The JT3L turbojet will be the powerplant for both the Boeing Model 717 and the Douglas DC-8. It is also specified for the Convair sweptwing transport design now being considered for purchase by Howard Hughes for Trans World Airlines.

The JT3L has been given a 1,000 hour test run simulating actual airline operations on a New York-Los Angeles route with a stop at Chicago. Less than 80 man hours of maintenance were required during this operation which was run in two 500 hour increments.

A plugged bearing oil line was the only service problem encountered during this operation. That occurred after 978 hours of continuous operations.

The J57 military versions of this split compressor design has been actually flown for 500 continuous hours without overhaul in accelerated service tests of the military aircraft it powers.

First prototype of Dassault Mystere 4 night-fighter was used by Mme. Auriol to set new women's speed record of 715 mph. (AW July 11, p. 7). Plane is development of Mystere 4 sweptwing day fighter; changes include two-place cockpit, nose redesign with underslung inlet and radome. Armament probably is a pair of French-built 30-mm. revolver cannon. Pilot and radarman seats are ejectable.

The Never Ending Watch

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Lear electro-mechanical actuators illustrated (left to right): 288 Power Unit, 413 Linear Actuator, 435 Linear Actuator, 249 Rotary Actuator, 257 Power Unit, 434 Linear Actuator. For information write: LEAR INC., Grand Rapids Division, Grand Rapids, Michigan

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Rothschild Favors Free Hand For CAB in Subsidy Allocation

Washington, D. C.—Commerce Department urges legislation giving Civil Aeronautics Board a free-hand to determine which airlines—mail-certificated or otherwise—should receive subsidy and which carriers should no longer be eligible for subsidy.

On these two points Commerce is in agreement with CAB (AW June 6, p. 123).

The department's views were expressed in a report by the Under Secretary for Transportation, Louis Rothschild to Sen. Warren Magnuson, chairman of the Senate Commerce Committee.

But, in advocating long-term subsidy contracts—so that carriers could calculate their revenue and the government would know the bill—Commerce is at odds with the Board. CAB Chairman Ross Rizley argued in favor of continuation of the quasi-judicial proceeding to determine subsidy, as well as mail pay rates.

"We believe there would be merit to subsidy contracts, since they would permit more orderly future planning for both the industry and the government," Rothschild declared in his report.

Recapture Provisions

He made these proposals for the contracts:

• **One half of a carrier's earnings** in excess of a reasonable profit should be subject to recapture at the end of the contract period. Rizley said that 100% should be recaptured, remarking, "while a subsidized carrier is entitled to a fair return on its investment, it is not entitled to excess profits."

Rothschild maintained that CAB should state at the beginning of the contract period specifically what would be considered a reasonable profit "so that the carrier would know from the start . . . what portions of his earnings may be subject to recapture."

• **Contracts should not exceed** five years in duration.

• **CAB should be permitted** to make maximum use of the informal conference procedure, where agreement on contract terms can be reached with the carrier without a hearing. There should be "opportunity" for a hearing, but such a hearing should not be a legal requirement.

• **Some "emergency" clause** may be necessary to permit reopening of the contract rates in the event of drastic changes in circumstances beyond the control of the carrier. "However, it should be made clear that such authority should be used sparingly, or else the significance of the contractual arrangement would be lost," Rothschild also added.

'Subsidy Eligibility'

Congress should enact a policy declaration that "subsidy, shall, to the maximum extent possible, be limited to temporary developmental aid" and CAB should be given clear authority to remove the basic eligibility for any such subsidy.

Under Rothschild's plan all common air carriers would be required to obtain certificates of convenience and necessity. Each certificate would state specifically if it authorized "eligibility for subsidy."

Certification for the carriage of mail would no longer automatically authorize an airline for such subsidy eligibility.

At the outset all carriers with mail certificates would be granted "eligibility for subsidy."

Rothschild added that CAB should be directed to "continuously review the operating results and financial position of carriers eligible to receive subsidy, with a view to eliminating such eligibility. . . ."

KC-135 Autopilot

Boeing KC-135 automatic flight equipment will be supplied by Lear, Inc.

Initial contract covers prototype autopilots and first production units with deliveries scheduled through 1957, from the Grand Rapids, Mich., Division.

Units will be modified L-10 systems developed for supersonic planes (AW Jan. 17, p. 52). Lear expects follow-on contracts for the KC-135 equipment to total several million dollars and says contract opens prospects of commercial orders when civil version of the four-jet Boeing transport is ordered.

CAA Will Evaluate 'High-Density' Rules

A high density air traffic zone has been established by the Civil Aeronautics Administration at Washington, D. C. as part of an experimental program aimed at improvement of air traffic control.

High density zone rules will apply to all aircraft operating in the area between August 1 and November 24, 1955. Aircraft operating in the zone must:

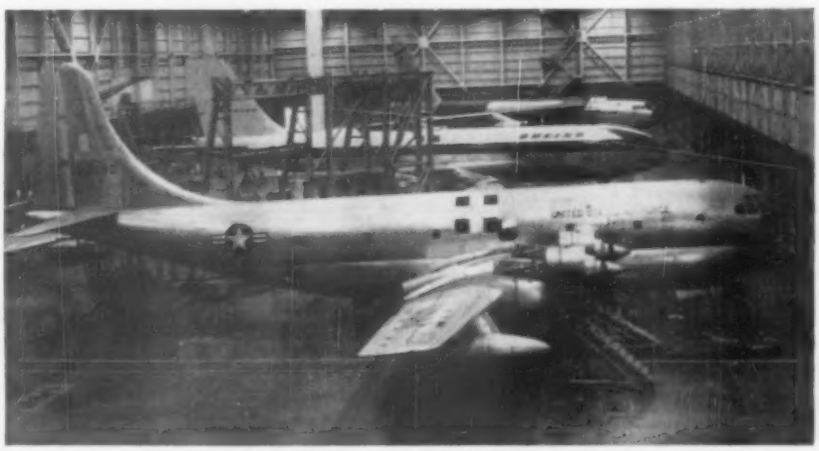
• **Be equipped** with a two-way radio.

• Establish and maintain communications with the appropriate control tower before entering or leaving the specified zone.

• **Observe** a speed limit of 180 miles per hour.

Operations under visual flight rules are prohibited unless ground visibility is at least one mile.

During the experimental period, operations will be monitored and evaluated by Special Working Group 8 of the Air Coordinating Committee, headed by J. N. Rogers, Chief, Special Operations



Crowded Corner at Boeing-Seattle

Three large Boeing aircraft undergoing tests at the company's flight test center in Seattle are shown in this view of a corner of the facility. In the foreground is one of the two YC-97J turbojet transports used as flying testbeds for the P&W T34 turboprop engine; in the middle is the prototype 707 jet transport, which has been flying for almost a year; in the rear is one of a number of B-52 Stratofortresses now in various phases of an exhaustive test program. Boeing maintains more than 650 employes at the flight test center.

This Directional Gyro incorporates advances in the art of gyroscopics which achieve an unusual degree of accuracy, and at the same time extreme ruggedness, making it ideal for aeroplane and missile applications where low drift is required; even under maximum vibration conditions.

SPECIFICATIONS:

Size: Diameter 5 inches
Length 5½ inches

Weight: 5.5 lbs.

Drift rate on Scorsby (excluding earth's rate) ±6°/hour maximum

Life: 1000 hours minimum

Potentiometer Pickoff – resolution 0.18° linearity 0.1%

Induction Motor – 400 cps, 115 volts

Vibration: Mil E 5272 A Procedure I extended to 2,000 cps.

Temperature Range: −54°C to +71°C

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Branch, CAA Office of Aviation Safety.

The Washington high density zone was first proposed by an ACC group in February, 1954. Last November, the CAB delegated the authority to establish the zone to the CAA, but opposition from small plane users, spearheaded by the Aircraft Owners and Pilots Association, held the project up. Public hearings were held, and the CAA has decided to go ahead with the plan.

To meet needs of light plane operators, the CAA has exempted certain limited areas south of Washington's National Airport from the high density zone regulations.

New Marine 'Tents' To Cut Airlift Cost

Air-transportable geodesic domes, designed by Buckminister Fuller, will replace all tents used by Marine Corps aviation units. Equipment comes in diameters of 36 ft., 42 ft., 55 ft. and 117 ft. and features lightweight metal construction covered with Neoprene-coated synthetic fabric. Movement overseas of a single Marine aircraft wing equipped with the domes will save $15 million compared with present equipment, Defense Dept. states.

Sailplane Designed for Upper Air

Los Angeles—A sailplane with a wingspan larger than a DC-7 has been designed for use in scientific research at altitudes above 70,000 ft.

The plane, designed by Victor M. Saudek, would have a wing span of 120 ft., three feet more than the big Douglas transport. The engineless craft could cover 2,000 miles, Saudek says, by riding jet streams. Cabin of the experimental gliding craft woul be pressurized.

Locating and exploring the areas in which air tends to be so turbulent that it may bring disaster to transport planes is cited as one of the many values it would have.

Sailplane design calls for a rudder height of more than 15 ft., and a gross weight of 3,250 lb. It would descend at 200 mph.

An engine-powered plane would tow the sailplane to an altitude of 12,000 ft. for the free takeoff in an area of rapidly ascending winds.

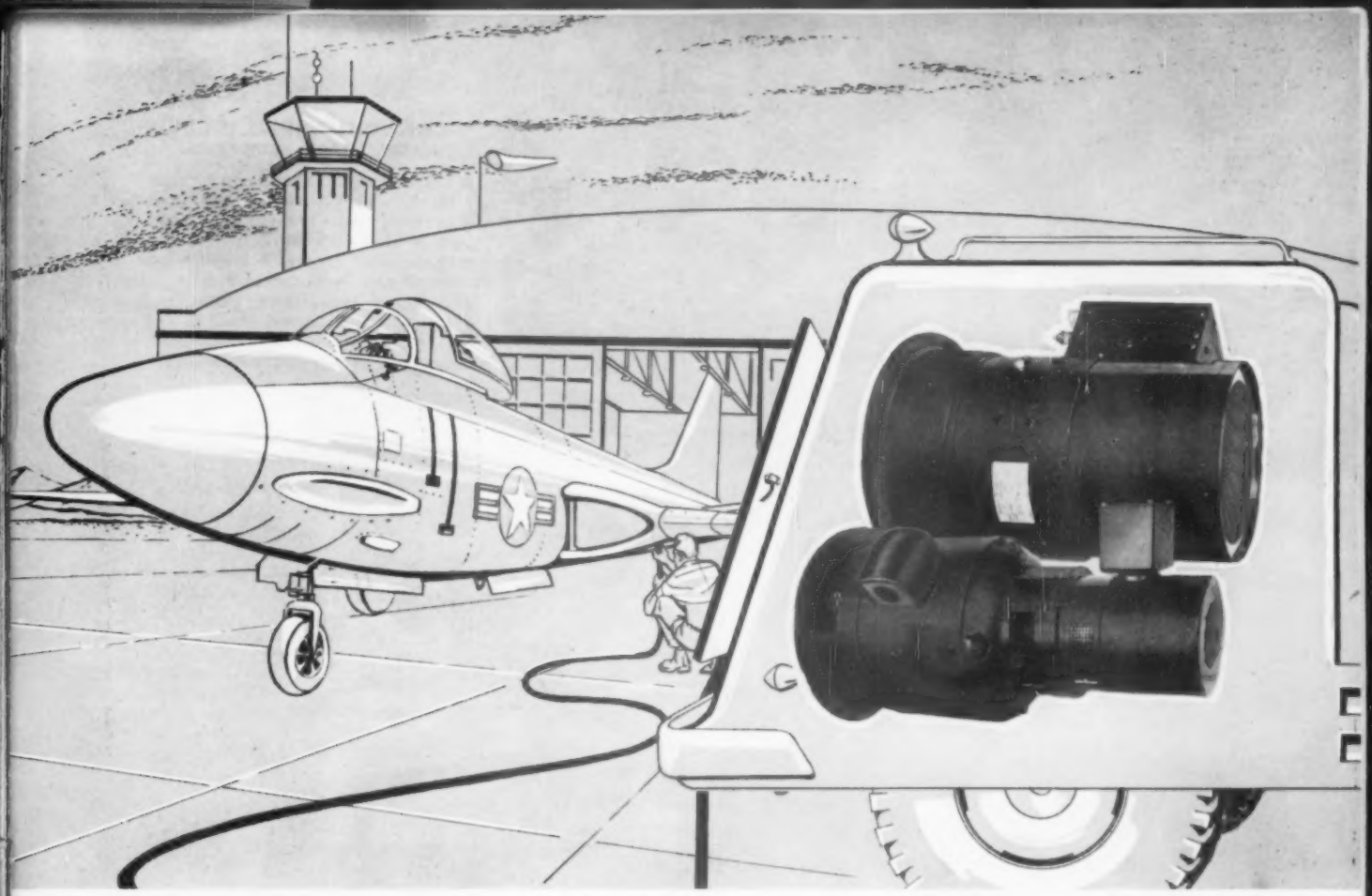
Referring to the 90,000 ft. unofficial world altitude record set by the Bell X-1A in 1954, Saudek says, "I'm not sure that a sailplane couldn't be built to go that high. The scientific values of having a sailplane of that competence are enormous. In my model I've arranged to carry a load of 600 lb. of instruments.

"We could explore cosmic rays at leisure where they enter the atmosphere. It would be easy to explore where rain really starts, investigate electrical properties high up, collect spores and investigat results of any atomic-bomb bursts."

Scientific instruments work much better in a sailplane than in a motored plane, Saudek points out, because there are no noise, vibration or magnetic disturbances.

Indonesian Stinger

This clean little single-place plane is a ground-support aircraft designed in Indonesia by Maj. Pringgoadisuryo, director of the IAF experimental section. Named "Sikumbang" (Bee), the plane is of conventional construction, with a steel-tube fuselage covered with aluminum alloy, a plywood wing and tail, and fixed landing gear. Powerplant is a de Havilland Gipsy rated at 200 hp., driving the Bee at 160 mph. at sea level. Range is 600 mi. Gross weight is 2,400 lb., wingspan 34.8 ft., length 26.75 ft. Propeller is wooden, two-blade, fixed-pitch unit. First flight was in August 1954.



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WHAT'S NEW

Publications Received

• **Fundamentals of Radar**—by S. A. Knight—Pub. by the Pitman Publishing Corp., 2 W. 45th St., New York 36, N. Y. $3.00; 150 pp. Basic survey of principles underlying radar, of particular interest to service personnel and students of radar and television.

• **Basic Lubrication Practice**—by Allen F. Brewer—Pub. by the Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. $6.75; 286 pp. Contains practical information for lubrication engineers, maintenance engineers, plant or shop foremen, purchasing agents and students.

• **ASTM Standards on Petroleum Products and Lubricants**—Prepared by ASTM Committee D-2 on Petroleum Products and Lubricants—Pub. by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $6.65 for cloth cover; $6.00 for paper cover; 980 pp. Compilation of specifications, indexes, and definitions covering petroleum products and lubricants.

• **Doctors in the Sky**—Robert J. Benford, M.D., Colonel, Medical Corps, USAF—Pub. by Charles C. Thomas, 301-327 East Lawrence Ave., Springfield, Ill. $8.75; 326 pp. History and activities of the Aero Medical Assn.

Telling the Market

Flaw Location With Dye Pentrants, 23-min. 16-mm. sound-and-color movie, Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1, Calif. . . . All Kodagraph materials available for **preparation and reproduction of drawings and documents,** selection chart, Graphic Reproduction Division, Eastman Kodak Co., Rochester 4, N. Y.

R-61 heavy-duty turret punch press, Bulletin 61, Wiedemann Machine Co., Dept. 110, P. O. Box 6794, 4272 Wissahickon Ave., Philadelphia 32, Pa. . . . **Damping Devices—Past, Present and Future;** history, design, operation, Gabriel Co., Dept. 1G, 1148 Euclid Ave., Cleveland 15, Ohio. . . . **Weight and bend data on standard alloy aluminum sheet,** wall chart, Kaiser Aluminum & Chemical Sales, Inc., Industrial Service Division, 1924 Broadway, Oakland 12, Calif.

Radio frequency connectors, Catalog D3, American Phenolic Corp., 1830 S. 54th Ave., Chicago 50, Ill. . . . **Model 232B power tube-flarer,** Catalog 1145A12, W. D. Wynant, Tube & Hose Division, Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio. . . . **Square and rectangular gage block accessories,** brochure, Ellstrom Standards Division, Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.

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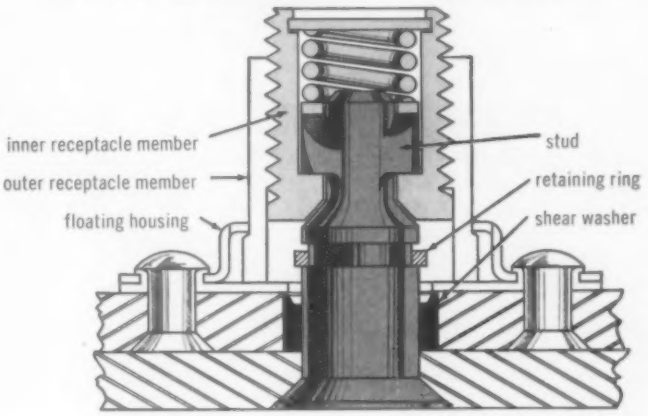

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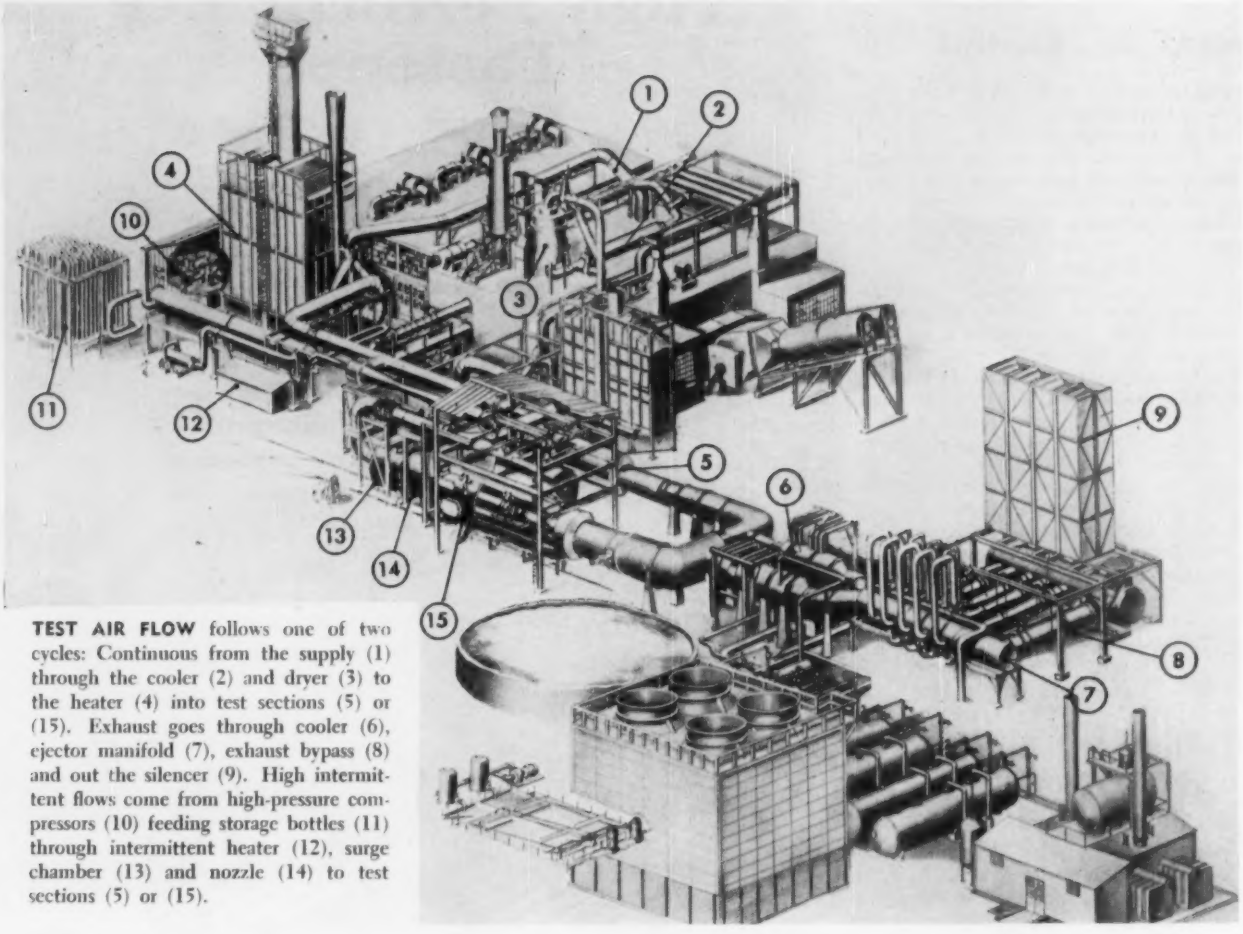


TEST AIR FLOW follows one of two cycles: Continuous from the supply (1) through the cooler (2) and dryer (3) to the heater (4) into test sections (5) or (15). Exhaust goes through cooler (6), ejector manifold (7), exhaust bypass (8) and out the silencer (9). High intermittent flows come from high-pressure compressors (10) feeding storage bottles (11) through intermittent heater (12), surge chamber (13) and nozzle (14) to test sections (5) or (15).

Wright's New Lab Tests Giant Ramjets

By David A. Anderton

Wood-Ridge, N. J.—Supersonic ramjet engines big enough to propel intercontinental missiles can be tested in the new Wright Aeronautical Division laboratory here.

The new facility is an enormous addition dwarfing the original test cell completed six years ago and still classed "among the finest in the world" by Curtiss-Wright chairman and president Roy T. Hurley.

Among the accomplishments of the original cell was the development testing of a ramjet engine that "completed the world's first successful controlled flight May 7, 1952, at a high Mach number." This engine presumably was flown in the Lockheed X-7 test vehicle, a delta-winged airframe developed first as a ramjet-powered missile, but later shifted to the role of flying test-bed for Wright and Marquardt supersonic ramjets.

The first test cell could handle a 50-in.-diameter ramjet, big enough to power the long-range North American Navaho missile; capacity of the new cell will be considerably larger, and will cover the altitude range from sea level to a simulated height near 50,000 ft.

Two Jobs

The new facility—in reality a gigantic addition to the original laboratory—will have two major tasks:

- **Combustion chamber development,** aimed at increasing the airflow speed at which efficient combustion can be maintained. Increased speeds at the combustion chamber inlet mean a shorter overall ramjet.
- **Supersonic diffuser development,** for increased efficiency of aerodynamic compression. At Mach numbers above 2, simple inlets have very low efficiencies and more sophisticated geometry must be used to obtain higher diffuser efficiencies.

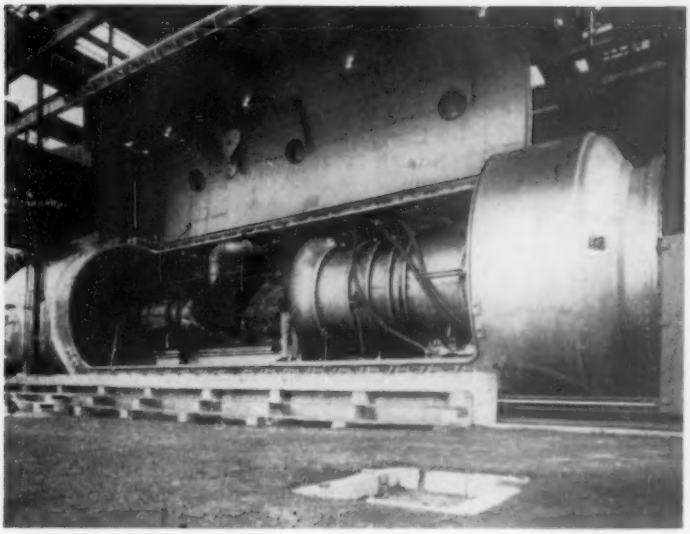
(Basic ramjet cycle and operational parameters were described last week in AVIATION WEEK, p. 33.)

Tests can be made of engines either in a free jet, simulating engine operation in free air, or in a connected-pipe, generally the technique used to develop combustion chambers only. Steady-flow tests can be made up to one hour in duration, limited in time by the recharge rate of the giant steam plant needed to drive the ejectors for altitude simulation, and the recharge rate of the air system.

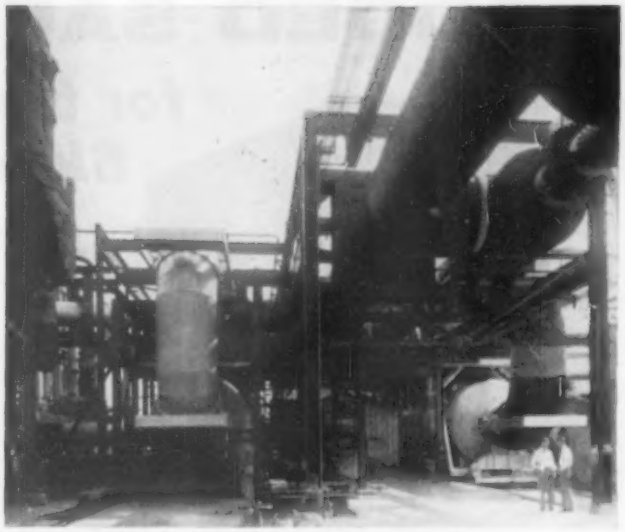
For short-time tests, a blowdown air storage system can provide massive air

ADDED SAFETY

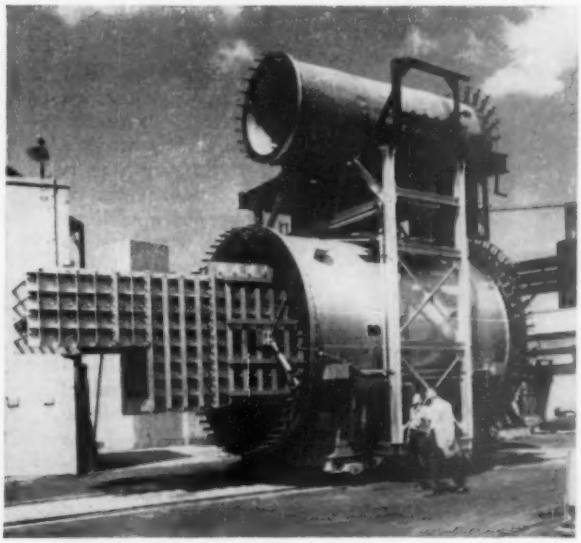
second blasts through the Curtiss-Wright test cell



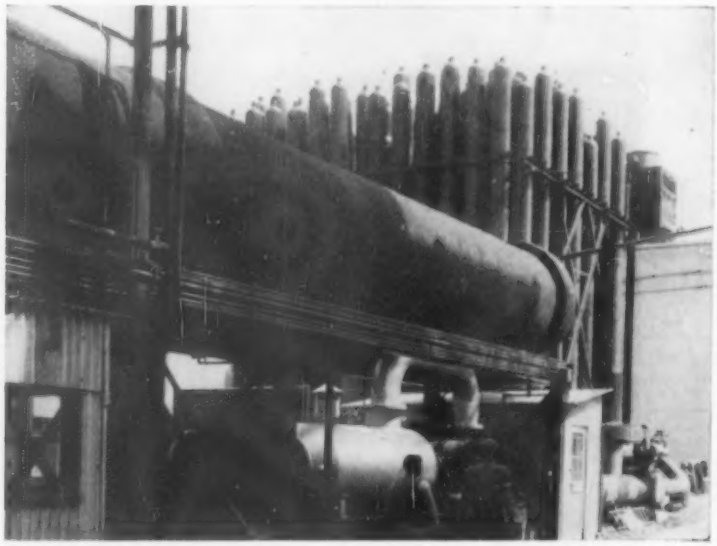
TEST SECTION of new ramjet facility is 98 ft. long, 14 ft. dia.



TWO STANDS (new at right) comprise ramjet laboratory.



FREE JET nozzle for ramjet tests can be wheeled into place.



HEATER AND BOTTLES are upstream portion of intermittent flow supply.

flows up to 700 lb. per second for about one minute.

Size of the new lab is comparable to high-altitude test cells at NACA's Lewis Flight Propulsion Laboratory at Cleveland, and the Air Force's Arnold Engineering Development Center, at Tullahoma, Tenn. The company says the installation is the largest privately operated supersonic high-altitude laboratory for the development and production testing of ramjet engines, which—even with all the qualifying phrases—is impressive.

First runs were made last fall in the new test cell; since then, development testing time has been increasing steadily. The addition cost $7.7 million—it brings to more than $18 million the total value of ramjet facilities at Wright.

Construction of the unit began in 1953 to the design of Curtiss-Wright engineers, following principles they developed nearly 10 years ago.

Impressions

To a casual visitor, the Wright test facility is impressive because of its sheer size. Piping, heat exchangers and ejectors tower overhead, and a two-million gallon water tank juts 70 ft. into the air. Masses of instrumentation and control knobs complicate the picture.

But to an engineer who has had to make-do with temporary facilities and airflows of a few pounds per second, the Wright set-up looks like Paradise.

In the new circuit, the test stand is a tank, 14 ft. in diameter and just short of 100 ft. long. A 36-ft.-long hatch swings up to free the test area for installation of engines or combustion-chamber sections.

The first test cell, installed some six years ago, is 12 ft. in diameter and 68 ft. long. It will take ramjet engines up to 50-in. diameter.

Noise and heat within the test cell are partially insulated by a 1-in.-thick layer of water flowing between the shells of the tank.

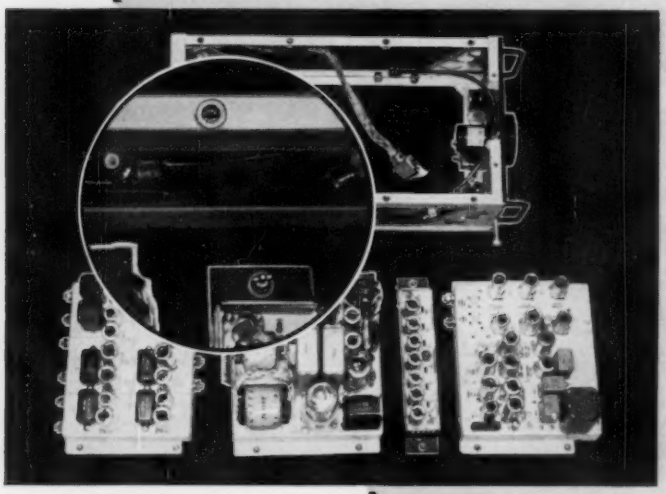
Hot exhaust from the engine on test is cooled by water spray before it enters the exhaust gas coolers. Thrust ratings of test engines currently are established by a heat balance computed from data taken during the exhaust-cooling cycle, but electronic systems will be used later.

Air supply for continuous running comes from a pair of old T35 turboprop compressors, back-to-back, driven by electric motors. For intermittent operation, reciprocating compressors charge air bottles at 3,200 psi. In blowdown use, about 700 lb. of air per

ADDED SAFETY
for the Skyways

RCA's new C-Band air-borne weather mapping radar unit marks a big-step toward all-weather commercial air transport service . . . a major contribution to added efficiency, safety and comfort in flight.

Efficient and safe, too, are the Camloc quarter-turn fasteners that hold the C-Band's electronic assemblies firmly in place. A quarter-turn and the Camloc fastener is opened fast. A quarter-turn and the Camloc fastener is closed fast—to hold fast!



Electronic components in this RCA C-Band radar accessory unit are assembled in groups for quick and easy servicing. Camloc quarter-turn fasteners provide the fast-acting, firm-holding means of insuring quick accessibility on the ground, vibration-proof operation in the air.

Camloc fasteners and latches are serving the aircraft and electronics fields in hundreds of ways. There's a Camloc device to meet your fastening needs, too. Write for complete information.

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second blasts through the Curtiss-Wright test cell.

Upstream of the test cell are heaters to raise air temperatures to values simulating flight at supersonic speed.

Heated air passes to the test section through a supersonic, variable-Mach-number nozzle with a speed range from Mach 1.5 to near 5.

Most of the instrumentation in the control room is automatic, tied to both punch-card systems and printers. Schlieren and periscope apparatus are used to observe the tests.

THRUST & DRAG

In a world bedeviled by a multitude of measurement systems that weigh things in pounds, poods and kilograms, it appears we need another system to be called "comparison units."

These are to be most useful to the people who write stories containing some obscure, highly technical unit such as horsepower or seat-miles. If I read a story about a new engine, its power is inevitably compared to a number of diesel locomotives; if it is a rocket engine, its thrust horsepower is compared to the maximum power of big ocean liners; the freight operations in air transport, I am told, would freight all the coffee in Brazil across the South Atlantic.

There's one trouble: horsepower I know about as a concept. But diesel locomotives—what power do they have? From 400 to 6,000, says a railroading friend. Ocean liners? Are we talking the Caronia or the Queens? And just how much coffee is there in Brazil? Instant, or in the bean?

See the trouble? We need a comparison unit. Then when the story says that the power is equivalent to 75 comparison units, we all know what the guy is talking about.

Better still, what's wrong with just plain horsepower?

* * *

The most nostalgic ride in the air today is on any venerable Douglas DC-3. You double up to get in the door, make the uphill trek to a single seat on the right side of the aisle and settle down. The engines are surprisingly quiet and takeoff is short.

Once aloft, the bent-wing bird saunters through the air leisurely at a modest altitude. If it's clear you can see the ground; if it's rough, the turbulence seems milder and the shaking gentler.

The stewardesses are new and eager; the crew works in plain sight. You have legroom and seatroom.

Landing is gentle; the flareout, the float and the rumbling shock as the

Judge a Product by its Users

In developing its versatile reconnaissance bomber, the RB-66, Douglas utilized a wide range of Aeroquip products and engineering services. The plumbing systems include Aeroquip weight-saving hose lines and, of particular note, rigid tubing assemblies made to precise specifications by Aeroquip.

Aeroquip

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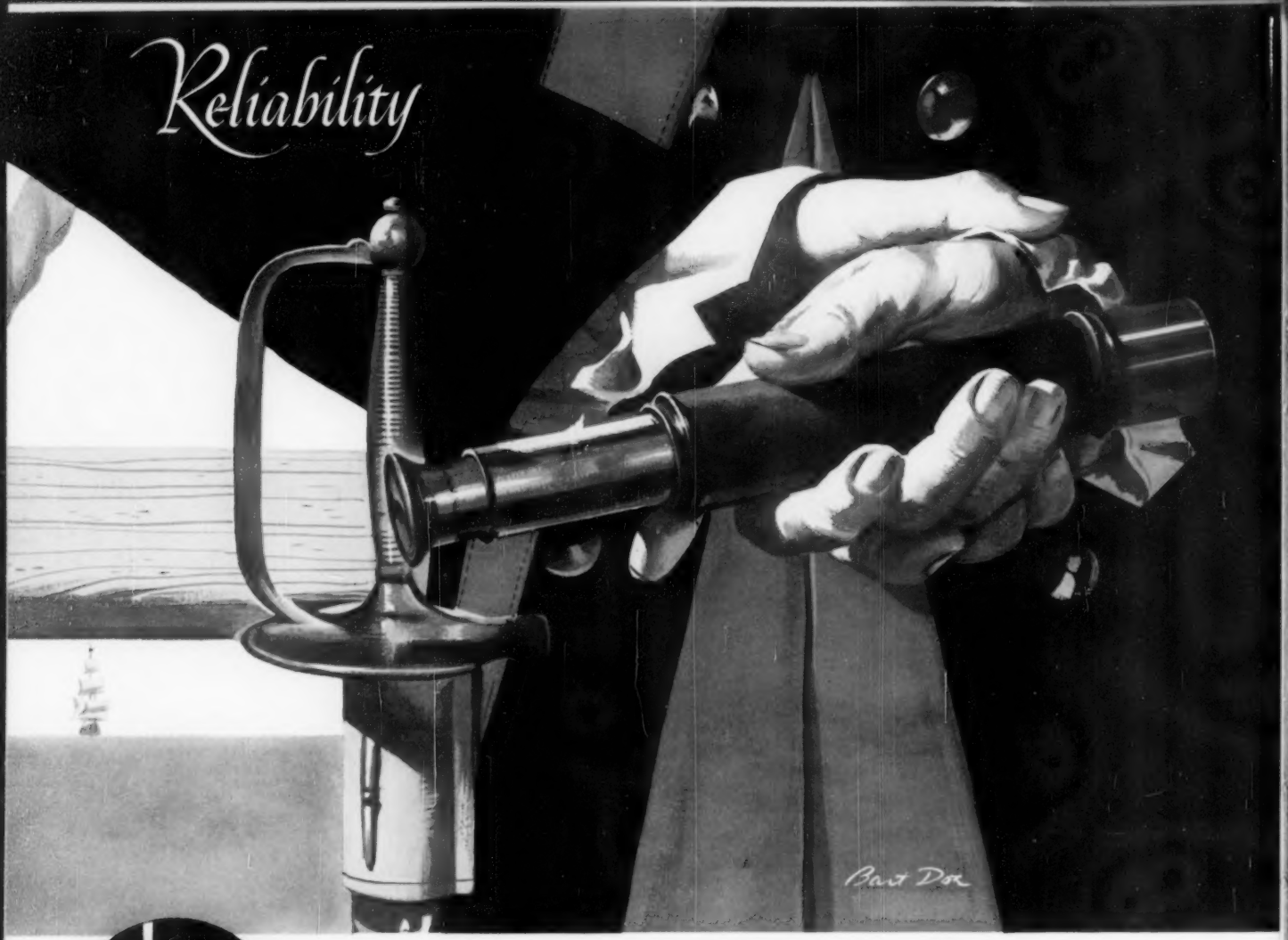
Local Representatives in Principal Cities in U.S.A. and Abroad. Aeroquip Products are fully Protected by Patents in U.S.A. and Abroad.



Rheem

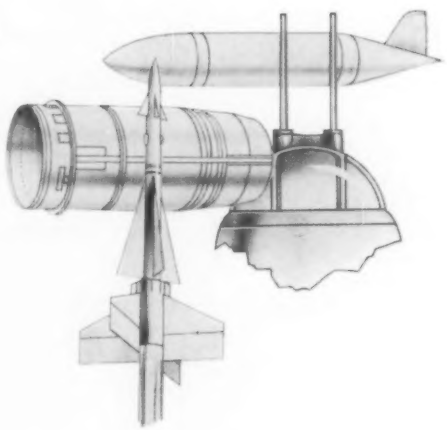
GOVERNMENT PRODUCTS DIVISION

Just as success sailed with John Paul Jones on the thundering, blood-soaked decks of *The Ranger* and *The Bon Homme Richard*, so in every major conflict to this day has victory crowned the valor of our fighting men.

Reliability in men and machines was, and is, the security of our nation.

At Rheem, we, too, are proud of the reliability of our men and machines and the enviable record of low per-unit cost and on-time completion schedules amassed in our role as prime contractor to the United States Government and sub-contractor to other industry leaders.

The Government Products Division facilities of Rheem are presently in quality development and production on air frames, missile and jet-engine components, airborne ordnance, electronics and ordnance materiel.



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wheels touch is of a different era.

That era was when air transport was getting its biggest push from the fast, twin-engined DC-3, and when an impending war was to build the highways of the sky. Since then, speeds have doubled, altitudes tripled, passenger loads quadrupled. Transporting people is a massive industry that seems to have no bounds.

Today, the DC-3's daughters and grand-daughters slice the cold upper air and make coast-to-coast travel a delight instead of a one-day trial. But I do hope that some airline flying a scenic route somewhere can afford to service that route with a DC-3 for just as long as the old lady will hold together. Here's one customer.

* * *

Once there was a Scientist, working in Advanced Research. His work was far beyond the understanding of most of his Fellow-Scientists; moreover, it was outstanding Work. It was so good, in fact, that the Scientist worried about the possibility that it might fall into the Wrong Hands. His Superiors were worried, and so were their Advisors.

"What can We do?" they asked Themselves. "We must keep this information from getting to a possible Enemy."

In one Corner of the Laboratory was a large Safe. Seeing it, the Scientist's Superiors and Advisors knew the solution.

"We will lock the Data in the Safe," they said, "And that will keep it from any Enemy. Furthermore, we will not tell anybody the Combination. That will be a Secret only we can share."

So they placed the Data in the Safe and locked it. And their judgment was vindicated, because no Enemy ever got his hands on it.

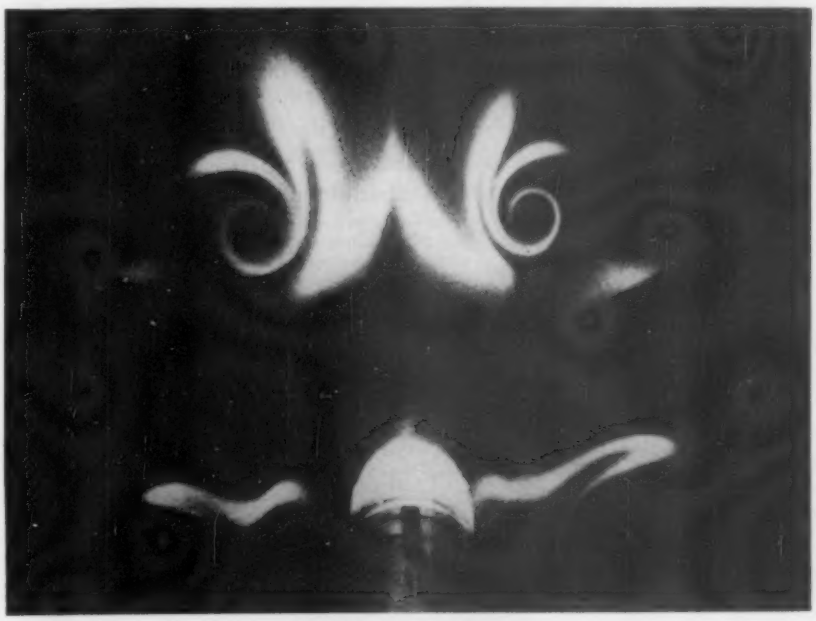
But neither did Friendly Scientists—and there were Some—who needed the Data badly in work They were doing. They completed their Project, but it was a second-rate Job.

Many months later, after the Radioactivity had dropped to a safe Level, some Enemy Scientists were probing through the wreckage of the Laboratory. In a corner they found a battered Safe, its paint seared and its Lock forced.

"Look at this," said one Scientist, drawing a thick Report from the Safe. He and the other read it carefully. Then they looked at each other. "We were very lucky, Comrade, very lucky," said the first One. "This plan for a Defense was indeed impregnable." —DAA

SAC Jet Bomber Mark

Strategic Air Command jet bombers passed the 1 million-hour flight mark recently, eight years after they were assigned to the command. USAF predicts that the force will log another million hours in about 15 months. SAC jet fighters and bombers are currently aloft some 50,000 hr. monthly. Figures do not include the jet-and-piston B-36.

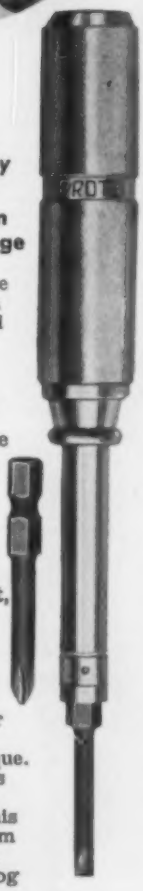


Visible Vortex

Vapor screen method, developed by NACA engineers for flow visualization, permits qualitative study of vortices generated downstream of a model. By creating a fog in the air stream and illuminating a cross-section of the stream with light through a narrow slit, it is possible to see the vortices as dark spirals in a light plane. This view is taken looking upstream in a wind tunnel; the sting mount for the model is at the bottom.

NEW PROTO TORQUE DRIVER

Speeds Assembly ...Prevents Rejects



- **Turns and torques both screws and nuts**
- **Releases *automatically* at preset torque limit**
- **Measures accurately in 4 to 80 inch-ounce range**

With PROTO's new Torque Driver—No. 6080—you can speed production work and still maintain accurate low torque on precision assemblies. As fast as a screw, nut or bolt can be tightened, it can be accurately torqued with the Torque Driver. It is especially suited for high-speed precision assembly work in the electronics, communications, aircraft and similar industries. With the many standard attachments on the market, the driver adapts quickly to handle all types of assembly-torquing jobs.

Using the same torque-*limiting* principle as the PROTO torquer, the driver releases automatically. It is impossible to overtorque. There are no dials, pointers or scales to watch—no projecting gadgets. Buy this money-saving new tool from your PROTO dealer today. Send 10¢ for 68-page catalog of entire PROTO line to

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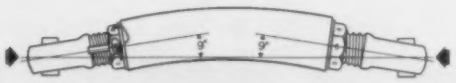
High capacity roller type for power-operated control systems
Ball bearing rod ends with high-strength shanks for manually operated control systems

A Complete Family of 5 sizes

Designed specifically with bearing capacity, shank strength, and bolt strength all in balance, the new Fafnir series of rod ends is the direct result of an NASC study in which Fafnir engineers participated. Every member of this rod end family is completely new, carefully engineered and tested. Together, they represent the first series of rod ends developed with a significant relationship between bearing capacity, shank and bolt strength. What's more, Fafnir Balanced Design Rod Ends are made to withstand column action under compression with angularity as high as 9°.



Even the shank threads of the new rod ends are precision rolled with rounded roots to assure maximum strength and fatigue life.

A Special Bulletin is available that fully describes design and constructional advantages . . . also shows dimensions and load-life ratings. FOR PROMPT RESPONSE ask for Balanced Design Rod End Bulletin. The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR

AIRCRAFT BEARINGS

FIRST . . . at the turning points in aircraft design

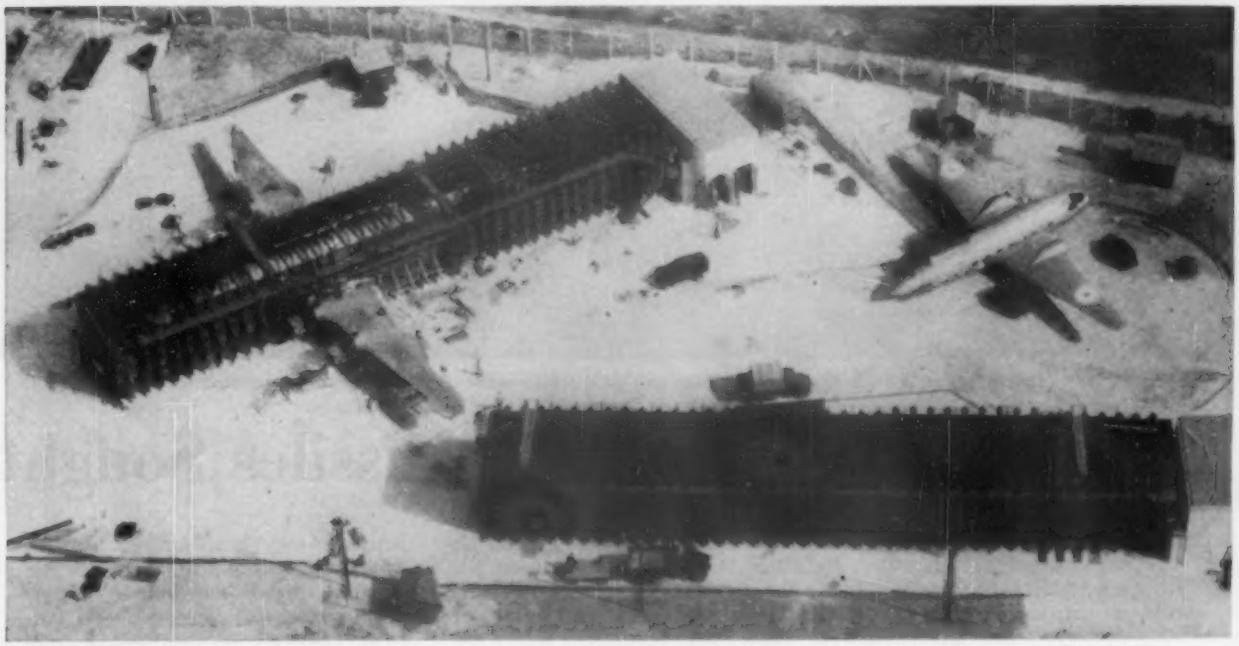
Bristol and RAE Test Britannias

Extensive flight and water-test program for the Bristol Britannia, long-range turboprop transport, is pacing the dual-source production of the airliner.

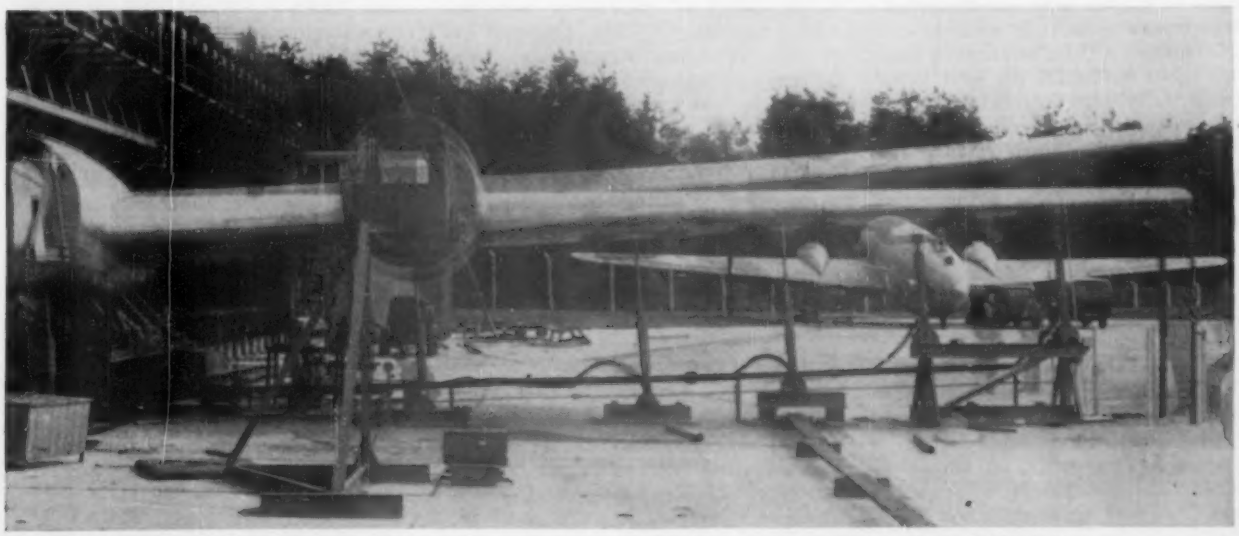
Third production (fourth aircraft) Britannia joined the flight-test planes June 29 on its first flight. A complete airframe is being pressure-tested under water in a technique developed for the DH Comet.

Eight more airframes are near completion at Bristol's Filton factory; second-source production is building up at Short.

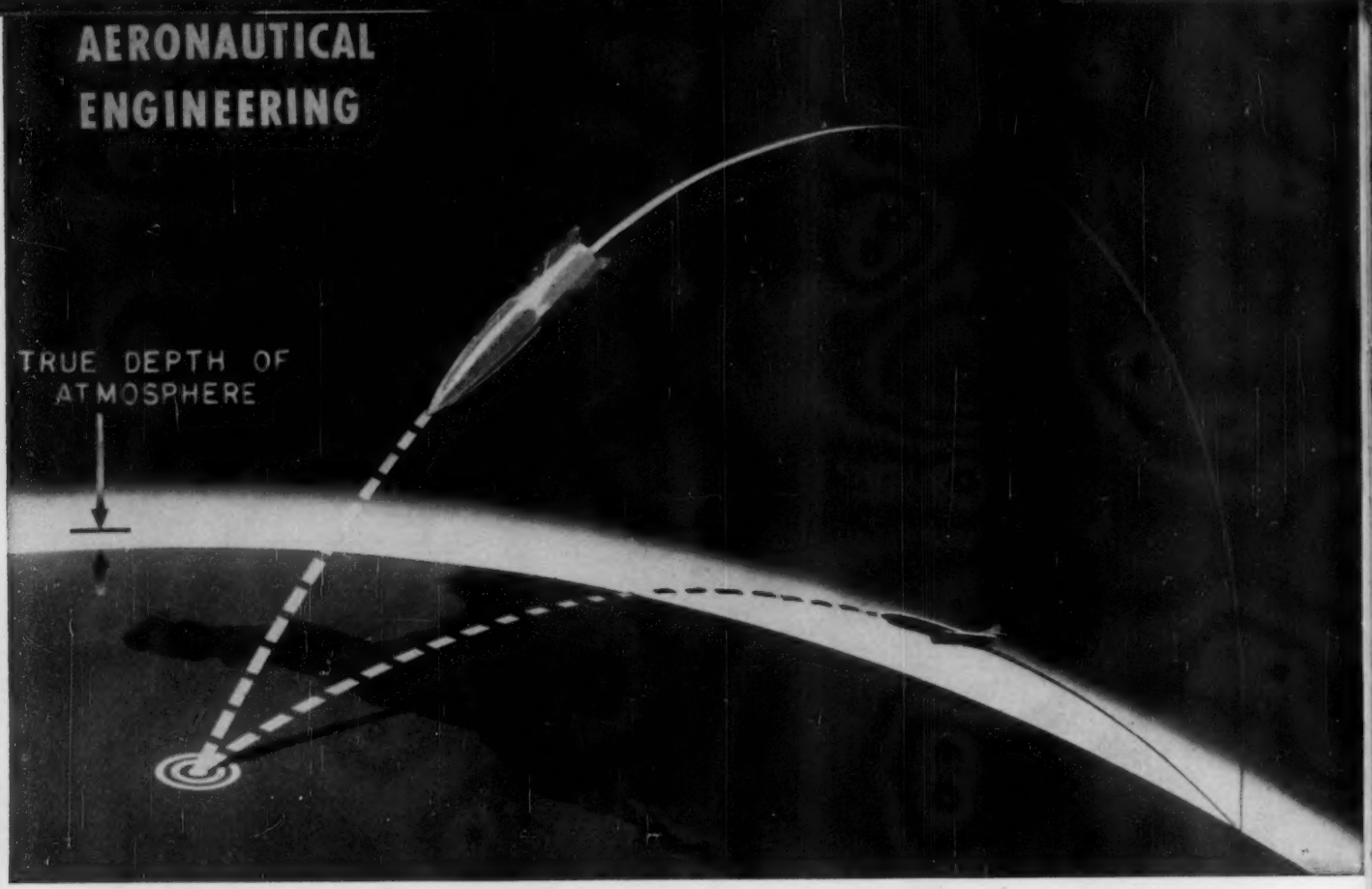
FOUR FOR FLIGHT: Prototype Britannia and first three production aircraft are now in flight test program with more than 1,800 hr. accumulated.



ONE FOR WATER: Pressure-test tank at RAE Farnborough surrounds Britannia airframe to be tested to destruction under water.



WING DEFLECTION of Britannia under water-test is result of simulated flight loads fed into airframe by hydraulic jacks.



AERODYNAMIC HEATING will be severe for hypersonic ballistic and glide type missiles. Trajectories are exaggerated for clarity.

Cooling for Hypersonic Missiles Sought

By Irving Stone

Moffett Field, Calif.—The formidable hurdle of aerodynamic heating stands between today's low supersonic performances and projected speeds of 10,000 to 15,000 mph. for tomorrow's intercontinental ballistic missiles.

No relatively thin metal skin alone is going to withstand the heat generated by very high supersonic flight—some cooling means will have to be devised to give built-in resistance. This problem will exist for hypersonic aircraft, as well as missiles, flying within the earth's atmosphere.

And because cooling won't be able to do the entire job of keeping surface heat levels to an acceptable value, airframes will have to be designed to absorb heat efficiently so that internal structure will be reasonably light, yet able to withstand high thermal stress.

These are some of the facets of hypersonic flight now being studied intensively by researchers at the Ames Aeronautical Laboratory of the National Advisory Committee for Aeronautics.

With missiles now flying at the threshold of this troublesome and far-reaching heat area, Ames researchers are ferreting out answers to fill in the wide gap of unknowns between present-day speeds and hypersonic values projected for the relatively near future.

Highlights of this work were revealed at NACA's 1955 Triennial Inspection at Ames. Researchers at the laboratory disclosed:

- **How heat is generated** on aerodynamic surfaces.
- **Possible solutions for heat dissipation** by transpiration of fluid through porous skin or by circulating the coolant beneath the skin.
- **An electrical analog** for predicting with high accuracy how airframes absorb heat through their internal structure.

Blunt for Cooling

While pointed bodies and wings with sharp leading edges will reduce drag at hypersonic speeds, they are undesirable from the viewpoint of heat transfer.

There is very little material at the tips to absorb the heat passing into them from the hot boundary layer and therefore, they heat up very rapidly.

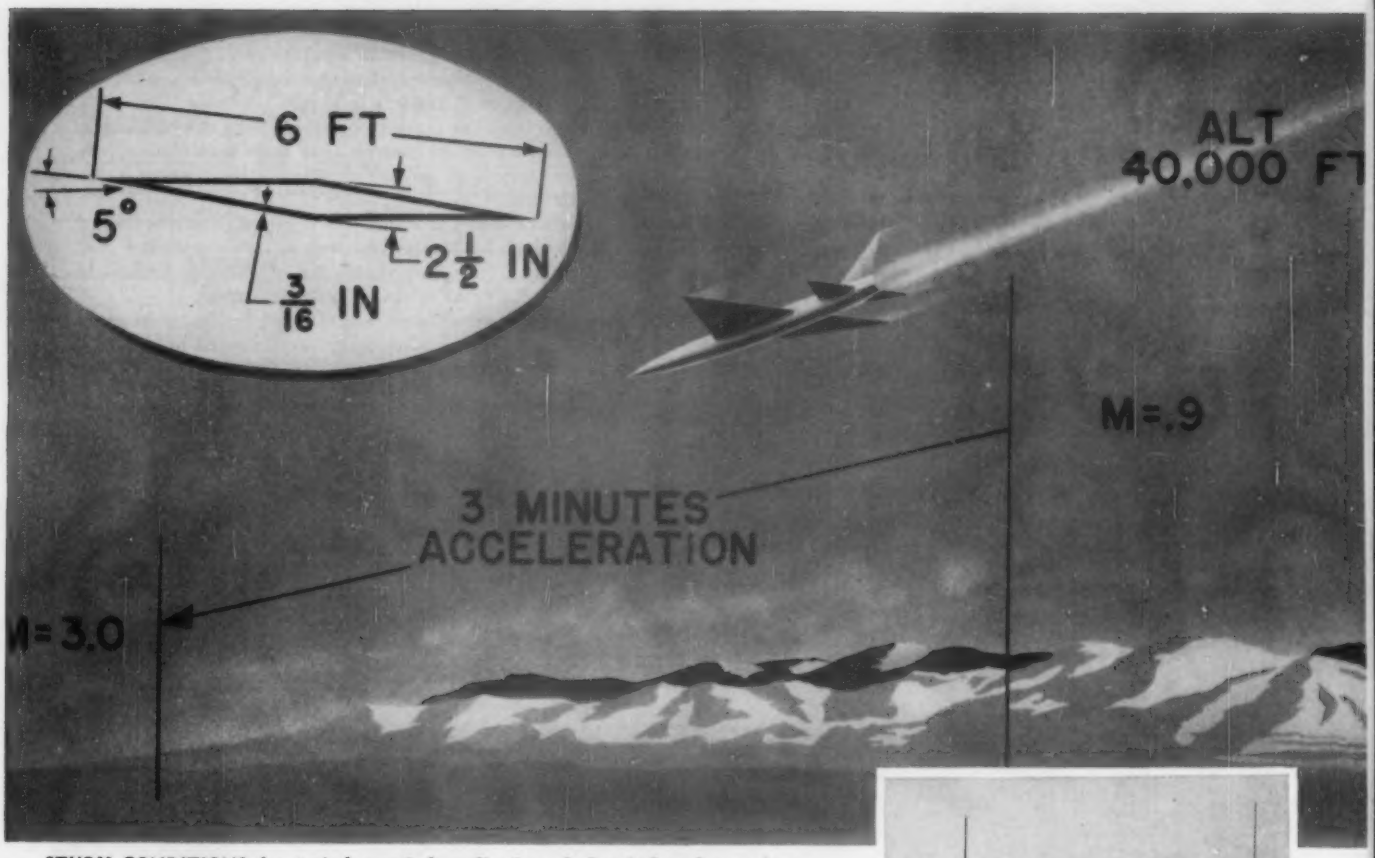
Films of experimental runs at the laboratory demonstrated these heat effects on comparative models in a low-speed stream of gas whose temperature corresponded to flight conditions at about Mach 6. A sharp-tipped body began to glow while one with a slightly blunted tip lagged in heating. When a large area of the nose of the sharp-tipped body became incandescent, the blunt body was noticeably cooler.

Similarly, a model of a plane with one wing panel having a sharp leading edge and the other panel with a blunt leading edge showed the sharp edge glowing while the blunt wing panel remained relatively cool.

Translated to actual hypersonic flight, this means that extreme surface temperatures brought on by aerodynamic heating could result in destruction of a missile or aircraft as it passed through the atmosphere, because of the intense heating and associated loss of material at the surface of the structure.

Sweating It Out

One of the most promising techniques now under consideration for



STUDY CONDITIONS for typical practical application of electrical analog at Ames.

by NACA

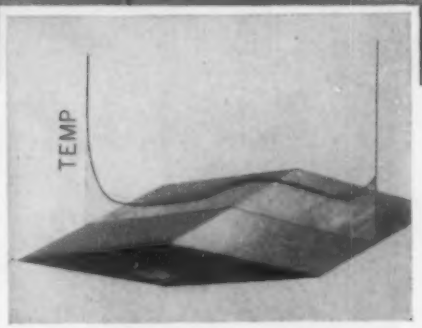
reducing heat transfer to highspeed missiles is transpiration cooling, also known as sweat cooling.

In this approach, a gas or liquid is passed through a porous metal skin to produce a blanketing effect reducing the quantity of heat transferred to the skin from the hot boundary layer air. It is likely that water would be used as the cooling medium because of its high heat capacity and high heat of vaporization. However, depending on weight factors and other operational considerations, some other liquid or gas might be used.

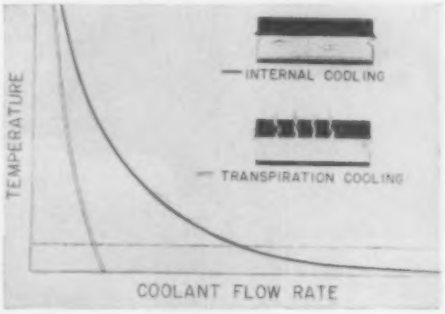
Another approach might be the use of a cooling liquid circulated directly beneath the skin and discharged overboard.

While transpiration cooling is more advantageous in that it would require a lower coolant flow rate than the internal cooling method—perhaps only a third as much in some cases—the latter has not yet been ruled out. The field is so new that no hard and fast solutions can be projected at the present time.

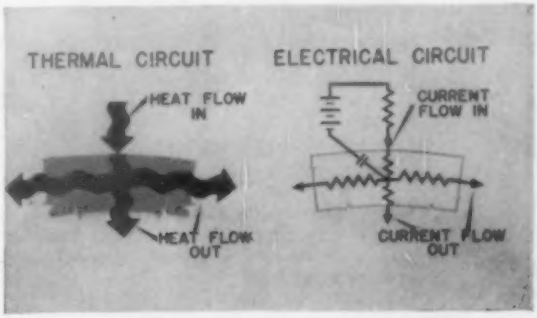
One instance where internal cooling of skin might be the practical answer



ELECTRICAL ANALOG reveals temperature conditions on double wedge wing surface after 2 min. of the acceleration period. Transition from laminar to turbulent flow just forward of wedge peak (at center) causes temperature rise which extends down trailing edge.



COMPARISON of transpiration and internal cooling flow rates. At reference temperature (dotted line), flow rate for transpiration method is about one-third that for internal cooling. Ames is studying both methods for combating aerodynamic heating.



HEAT-RESISTANT structures of high efficiency are expected to result from Ames research using electrical analogs to solve aerodynamic heating problems. Method is accurate, simple to use, and flexible.

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. . . selected to maintain correct cabin temperature on new Super Constellation

Aboard the new Super Constellation passengers travel in luxurious comfort. Contributing greatly to this are roomy new seating arrangements . . . handsome cabin appointments . . . and, most important, a highly efficient system that assures comfortable cabin temperature at all times.

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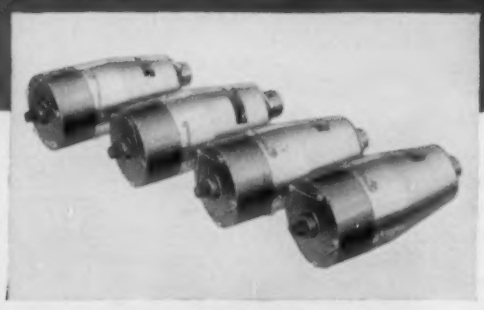

Recent additions to the 22 Barber-Colman components supplied directly to Lockheed for the Super Constellation are four rotary actuators to position the primary aftercooler inlet and outlet doors.

The complete line of Barber-Colman aircraft controls includes: Valves; Positioning Controls; Actuators; Temperature Controls; Small Motors; Ultra-Sensitive Relays; Thermo-Sensitive Elements. Write for catalog F-1141. Engineering sales offices in Los Angeles, Seattle, Baltimore, New York, Montreal.

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op·por·tu·ni·ty (op/ərtu′nəti), n.,
advantage of convenience of situation;
appropriate or favorable time or occasion.

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would be at extremely high altitudes, where radiation heating would be the predominant source of input. In such a case, it is conceivable that coolant could be circulated internally in a closed system from the cold side of the aircraft to the surface exposed to radiation. Because a fixed amount of coolant would be required, it would minimize the weight penalty involved in carrying the gas or liquid.

Other possible schemes include the use of insulating material on the skin. This could conceivably involve many problems not likely to be overcome easily—method of bonding the insulation to the skin and the degree of aerodynamic smoothness which would have to be attained in insulating material.

Still another approach is the simple expedient of making the surface shell of the missile thick enough to absorb sufficient heat to keep the internal structure relatively cool. At hypersonic flight, some of the thick material might melt away, but enough might remain to insure structural integrity for completion of the flight. Here again, one of the controlling factors would be the weight penalty of the thick shell.

Boundary Layer

In connection with aerodynamic heating investigations, transition from laminar to turbulent boundary layer is under intensive study at Ames. It is known that the laminar boundary layer transmits much less heat than its turbulent counterpart—perhaps only ¼ or ⅛ as much.

Thus, if research reveals how the transition from laminar to turbulent flow can be delayed, the heat input to the skin and the structure beneath could be lessened considerably, with the result that lighter structure could be designed for the airframe.

Researchers don't expect that a cooling system will take care of all the heat generated on airframe surfaces at very high speeds. Some of the heat will flow to internal structure and, in periods of relatively prolonged flight through the atmosphere at high speeds, the heat soaked up by the airframe might be considerable. The structure will have to be designed with sufficient margin of safety to withstand the induced thermal stresses.

Mathematics involved in the solution of the heat absorption problem is complex—structure generally is complicated, heating is non-uniform. A heavy spar will rise in temperature much slower than the skin above it; rib or stiffener members would have still other heat values.

Current Simulates Heat

To speed solution to the structural heating problem, Ames researchers have developed an electrical analog. Aim of the device (procedure) is to eliminate necessity of building various heavily instrumented structures for thermal study, along with costly heating equipment.

The analog is simple and flexible. Electrical resistances are used as the equivalent of thermal resistances in the structure. Current flow is directly related to heat flow. Voltage drop between any two points is equivalent to temperature drop between corresponding points in the structure. Condensers store electrical energy just as a structure stores heat. When a condenser is charged it means that particular area has reached a steady-state condition and more of the current then flows to another part of the analog to establish another equilibrium condition.

To use the analog accurately, known factors must include such items as conductivity of metals involved, specific heat of the material, resistance to flow across joints. Temperature and characteristics of the boundary layer also must be known, and are obtained by wind tunnel and other techniques.

Ames researchers effectively demonstrated the accuracy of the electrical analog with reference to a segment of a wing structure consisting of a portion of skin and its bulb-angle stiffener.

In the run with the actual structural

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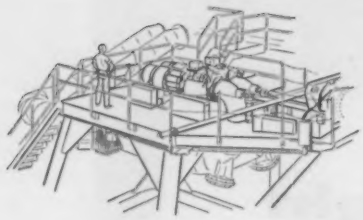

. . . have performed perfectly for hours after oil supply was interrupted

Breaking "bearing barriers" is a habit with Hyatt, builder of more jet engine roller bearings than any other manufacturer—*but Hyatt engineers have really outdone themselves with this sensational new development!*

These "Safety Reserve" oil-impregnated, sintered bronze cage roller bearings, applied to the compressor and turbine shafts of jet engines, have *performed perfectly for hours after the oil supply was interrupted.* Here at last is the answer to the oil-system-failure problem—an answer that will soon be bringing planes and pilots safely home despite loss of lube. Remember, when you're faced with a formidable "bearing barrier," *come to Hyatt for help!*

THE SECRET of this extraordinary new bearing is the ability of its porous sintered bronze cage to retain many hours' reserve supply of oil. Each tiny interstice acts as a lifesaving "oil well" which prevents bearing failure even when all outside lubrication has been interrupted for hours at the tremendously high rpm's and temperatures developed by jet engines.

HYATT ROLLER BEARINGS

STRAIGHT BARREL TAPER

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segment, a heater mounted on the outer face of the skin represented frictional heating. Thermocouples installed in the skin and in the stiffener bulb were connected through amplifiers to dial pointers, one indicating skin temperature, the other bulb temperature.

With heat applied, skin temperature rose rapidly, while bulb temperature hardly changed. At the end of the heating period, skin temperature reached about 350F, while the heavier bulb member had climbed to only 140F. This condition would cause warpage in the structure, with possible buckling of the skin. With heat turned off, bulb temperature continued to rise, indicating the large thermal lag involved.

Structural temperature differences of this magnitude are characteristic of highspeed aircraft, Ames researchers say.

Exhibiting the analog's performance, researchers had its circuit set up on the back of a dial indicator similar to that used for the actual structural segment. Current was fed into the circuit at points to represent flow of heat into the segment model. Voltage was measured at points corresponding to locations of the thermocouples in the skin and stiffener bulb. These voltages were converted into equivalent temperature indications shown by dial pointers.

With the switch thrown, the current flowed into the analog. Pointers reacted as they did for run with the structural heat-flow model—skin temperature rose faster than bulb temperature, and each reached the same values as before, 350F for the skin, about 140F for the bulb. Lag characteristic also behaved similarly.

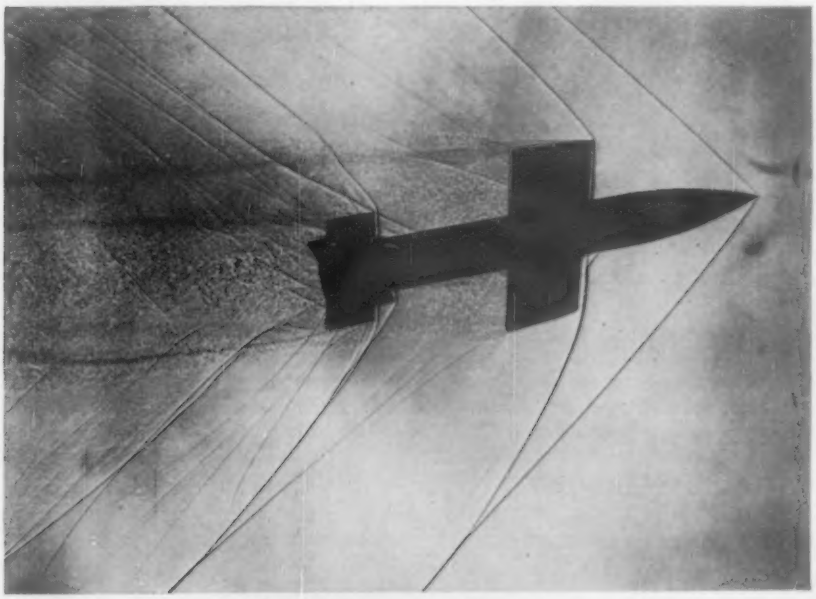
Wing Distribution

An analog analysis of surface temperature distribution for a supersonic wing also was presented to illustrate a typical practical application of the electrical device.

Conditions assumed that the plane was flying at 40,000 ft. and accelerated from Mach 0.9 to Mach 3 in three minutes, after which speed was held constant. The wing, a double-wedge configuration with a 6-ft. chord and 2½-in. thickness, was assumed to have a titanium skin ⅛ in. thick. Wing was flown at an angle of attack of 5 deg.

Upper wing-surface temperature distribution, as computed by the analog for two minutes after start of acceleration, revealed severe chordwise variations in temperature at the thin leading edge. Progressing aft, there was a transition region from laminar to turbulent flow just forward of the double wedge peak at the wing center chord point.

This in turn, resulted in buildup of temperature along the aft portion of the wing to the trailing edge, exceeding the values for the portion aft of the leading edge. As heating continued,



Shadowgraph Shocks

This is the flow pattern behind a simple configuration of a research model shown by the shadowgraph technique. Fired from a 3-in. smoothbore naval gun into still air at NACA's Ames Aeronautical Laboratory, the model is speeding at Mach 1.6 past a camera station illuminated by a high-intensity electric spark. Irregularity of the shock-wave pattern shows the model is maneuvering. Strong shock waves at nose and ahead of wings and tail show darkly; weaker shocks show as light lines. Turbulent wake behind the model shows dark lines characteristic of vortex formation.

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temperature variations became more pronounced.

Four minutes after acceleration start, the lower surface became hotter than the upper surface, which would tend to make the wing warp upward.

Big factor in investigation of hypersonic flow and aerodynamic heating is the development of a variety of equipment to provide data at the speeds involved—no single piece of equipment will provide all the information.

Thus, the investigation of factors which influence aerodynamic heating, such as rate of heat transfer, boundary layer temperature, effects of cooling devices and how these factors are influenced by changes in Mach number and aerodynamic shape, is being carried on in Ames' new 10x12-in. heat transfer tunnel, the new 8-in. low-density facility, the supersonic free-flight tunnel, 10x14-in. supersonic facility and others.

In the new heat transfer tunnel, the air supply is heated so that true boundary layer temperatures and heating conditions are duplicated at hypersonic speeds, to provide quantitative data for the electrical analog.

The new low-density tunnel gives air pressures encountered at altitudes over 100,000 ft., is used for determination of heat transfer rates at these heights.

Armed Forces to List 1956 Tool Projects

Deadline of July 29 has been set for Army, Navy and Air Force to submit to the Defense Department their proposed Fiscal 1956 reserve tool and facilities projects.

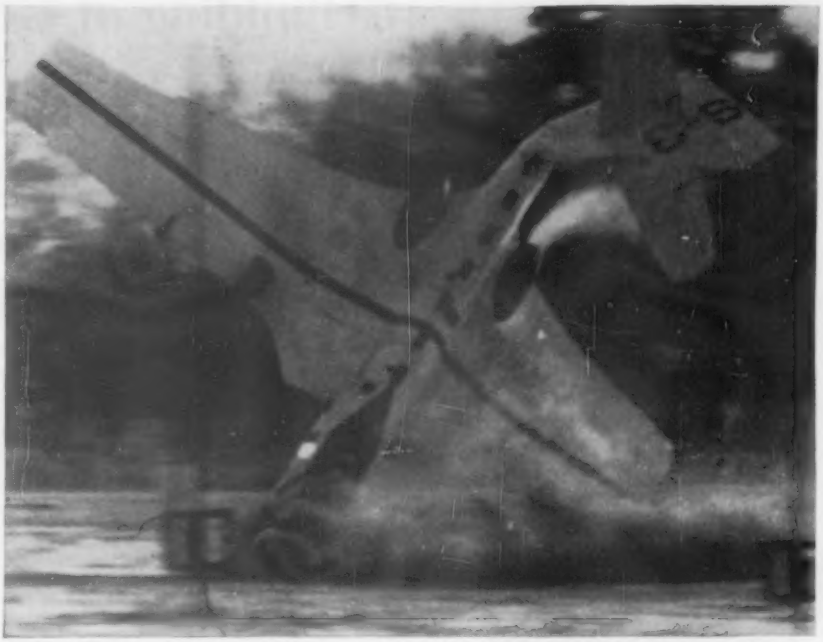
With a warning that funds are limited and requests must be reasonable, T. O. Pike, Assistant Secretary of Defense for Supply and Logistics, has told the armed forces they must consider machining for designs now under development as well as items of current design.

His office will consider requests only for tools and production equipment "required during the first year of mobilization and having a manufacturing cycle time of six months or more, or an anticipated mobilization lead time of one year or more."

Tools Ordered

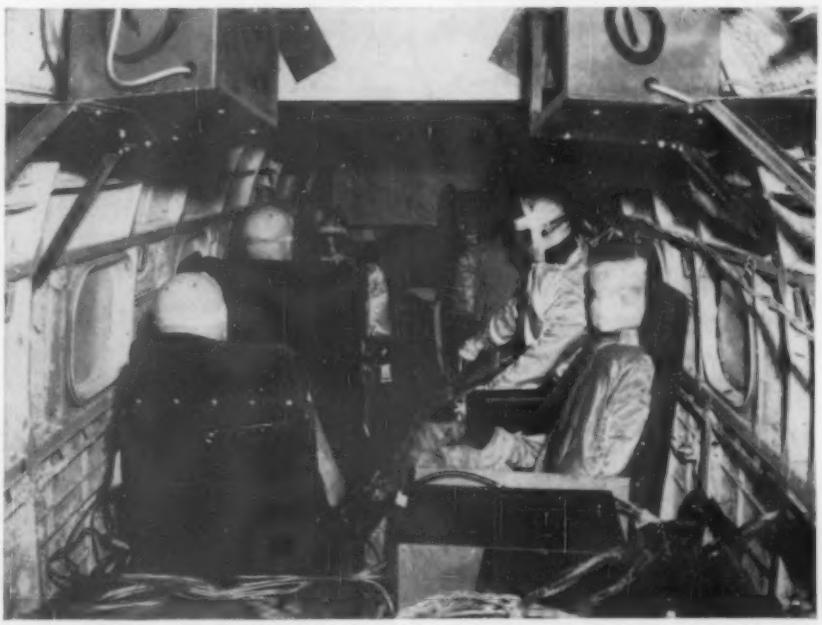
U. S. Air Force has awarded $11 million in contracts for long leadtime machine tools required for mobilization.

Milling and broaching machines will be made by Onsrud Machine Works, Chicago; Farnham Division, Weisner-Rapp Co., Buffalo; Colonial Broach Co., Detroit, and Lapointe Machine Tool Co., Hudson, Mass.



MCDONNELL FH-1 PHANTOM tail twists as obsolete Navy twin-jet fighter cartwheels during simulated crash landing at NACA's Lewis Flight Propulsion Laboratory, Cleveland, Ohio. Jets and piston-powered planes are being expended here in a research program to develop design principles aimed at reducing airplane crash and fire casualties. Transports and light private planes have also been used in the controlled crash tests. The research group has successfully demonstrated experimental inerting systems designed to cut fire hazards, including high-pressure water spray onto hot parts to cool them (AW July 5, 1954, p. 33).

NACA Probes Crash Safety



SIX DUMMY PASSENGERS ride worn-out transport plane used in NACA's crash safety experiments which are providing data on impact survival. Seated in different portions of the airplane and in various positions, the dummies carry sensitive instruments to measure crash forces. Also evaluated are conventional seats and experimental shock-absorbing types designed by NACA, which have cushioning members that flex to form a protective pocket around the occupants (AW July 26, 1954, p. 30). These seats also incorporate a greater number of floor attachment points than conventional types to prevent them from tearing loose. Lewis Lab crash safety studies thus far have utilized 37 discarded military aircraft.

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Rebuilding of German Aviation Research Units Off to Fast Start

Bonn—An independent research organization including all the sections of the Deutsche Versuchsanstalt fuer Luftfahrt (German Research Institute for Aviation) is being built up at the Essen-Muelheim airport.

The new group will continue the job of DVL begun in 1912 and carried on until 1945 when the facilities at Adlershof near Berlin fell into Russian hands and were shipped to the USSR.

Some time ago, the new DVL resumed work on its new site at the Essen-Muelheim airfield. The construction of hangar is almost completed, the runway for trial flights is being put in order and the construction of a building for two DVL institutes will soon be started. Two other institutes —for high-frequency engineering and for thermodynamics and fuel research—are still inadequately housed.

The research center is to house eight DVL sections, specializing in high frequency; machine dynamics and development; statics and stress analysis; aerodynamics; thermodynamics and fuel research; turbojet propulsion; materials research; gliders, balloons, parachutes and powered aircraft.

Other DVL institutes are working at Aachen, Bonn, and in Bavaria. The Institute for Physiological Aviation Research will remain in Bonn and is to be given a branch office at Essen-Muelheim where the applicants for the Lufthansa staff will undergo their physical qualification tests.

The Institute for Aircraft Fuel and Lubricants will continue at Munich.

Close cooperation exists between the DVL and the Aircraft Radio Research Institute at Oberfpaffenhofen in Bavaria.

It is expected that the Federal Government, the Federal States and the relevant industries will raise the necessary funds for the Essen-Muelheim project.

Meanwhile, work in the individual institutes is steadily increasing. In Aachen, where the majority of the institutes are concentrated for the time being, it is possible to hear gas turbines roar, to watch experiments in wind tunnels, or to see models of new ramjets or other propulsive units.

In this connection, Professor Seewald, the chairman of the supervisory board of the DVL, said: "It is easy to foretell that apart from the piston and turbine engines which are already in use, engines working along the principle of pure ramjets or of the Schmidt pipes (flying stovepipe) which have been known in Germany since they used to be built into the V-1, will in the near future be of some importance. Such

Blustery Blower

Boeing engineers believe contemporary aircraft need less than the customary anti-icing and de-icing equipment; to prove the point, they built this icing tunnel, soon to start operations at Boeing's Plant 2 in Seattle, Wash. With a 15x20-in. test section, the tunnel can blast a model or an airfoil with icy winds up to 250 mph., and drop the temperature to as low as —30F. The tunnel is fed by cold air from a climate room used to test aircraft components under cold conditions. The engineers hope to substantiate their theory that de-icers and anti-icing equipment can be simplified.

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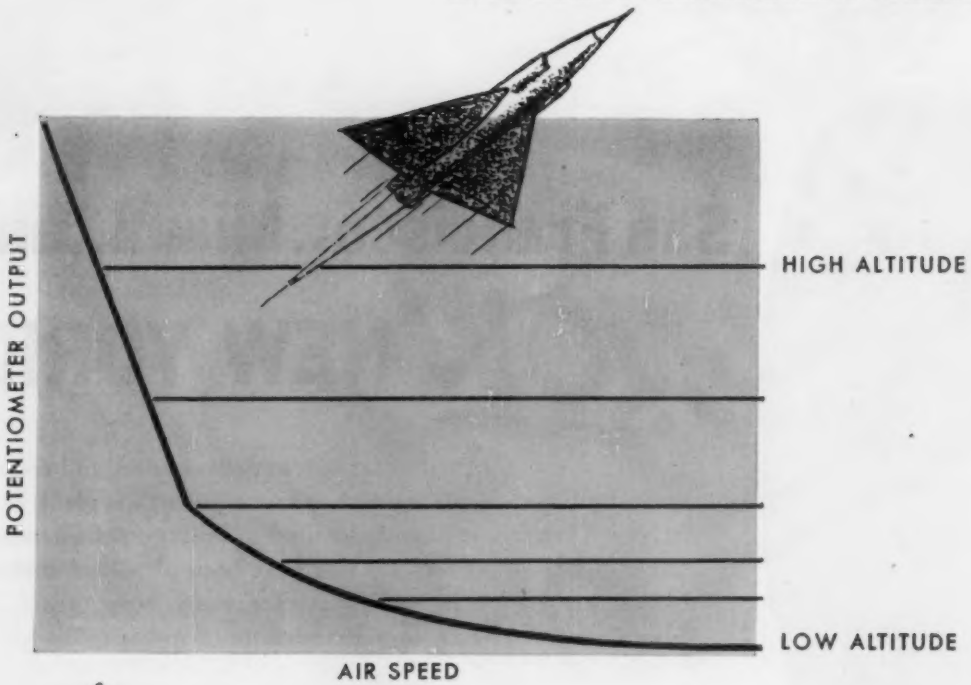

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propulsive units contain only a few or no moving parts; owing to this simple construction, it will be possible in the future not only to avoid many interference factors but, in comparison with the propulsive units in use today, these simplified mechanisms will also be far cheaper. "Since in other countries, too, the development of these new kinds of propulsive units has not been started on a broad basis, the chances for German industry in this particular field seem very propitious."

Stress tests on turbine blades are being made in the Institute for Turbo Engines. For this purpose, a hot-gas turbine of 500-hp. capacity war specially developed. A photoelectric cell measures temperature by the intensity of radiation from the blades. This device also serves to test the working life of the turbine blades.

Research concerning the behavior of microwaves under the meteorological conditions of the West German area, of which little is known so far, is being conducted in the Institute for High Frequency Engineering. Attempts are being made, in conjunction with the Meteorological Station of Rhineland-Westphalia at Essen-Muelheim, to find the reasons for the interference effects of rain and snow on radar operations. Experts say that these investigations may open up new possibilities for more accurate weather research.

The Institute for Physiological Aviation Research will also investigate the important question of noise and vibration during flight and their effects on human beings.

At present, a total of about 50 technicians and scientists is working at the DVL institutes.

Opinions Clash

Defense Department has received from industry some conflicting opinions on the proposed revisions to ASPR Section XV (AW July 4, p. 14).

While the Aircraft Industries Assn. says it prefers the existing regulations, the Machinery & Allied Products Institute has prefaced its comments with words of praise for the revision.

Says the Institute:

"In general, the proposed revision . . . appears to be an improvement over the present regulatory language which it is designed to amend. The proposed amendment is well written, generally clear in its language, and is to be commended for its inclusion of certain contract cost items not heretofore specifically covered in procurement regulations.

"Moreover, we find useful the new pattern of the regulation, which includes as to each item of cost a definition, a statement as to the extent of allowability or unallowability, and a specific indication as to whether or not special contract provisions are required to make the item allowable as a contract cost."

IBM Gets $3.5 Million Certificate of Necessity

International Business Machines Corporation of Poughkeepsie, N. Y., has been granted a $3,576,000 certificate of necessity for research and development of electronic devices by the Office of Defense Mobilization with 50% of the amount allowed for rapid tax amortization.

Other certificates recently issued were:

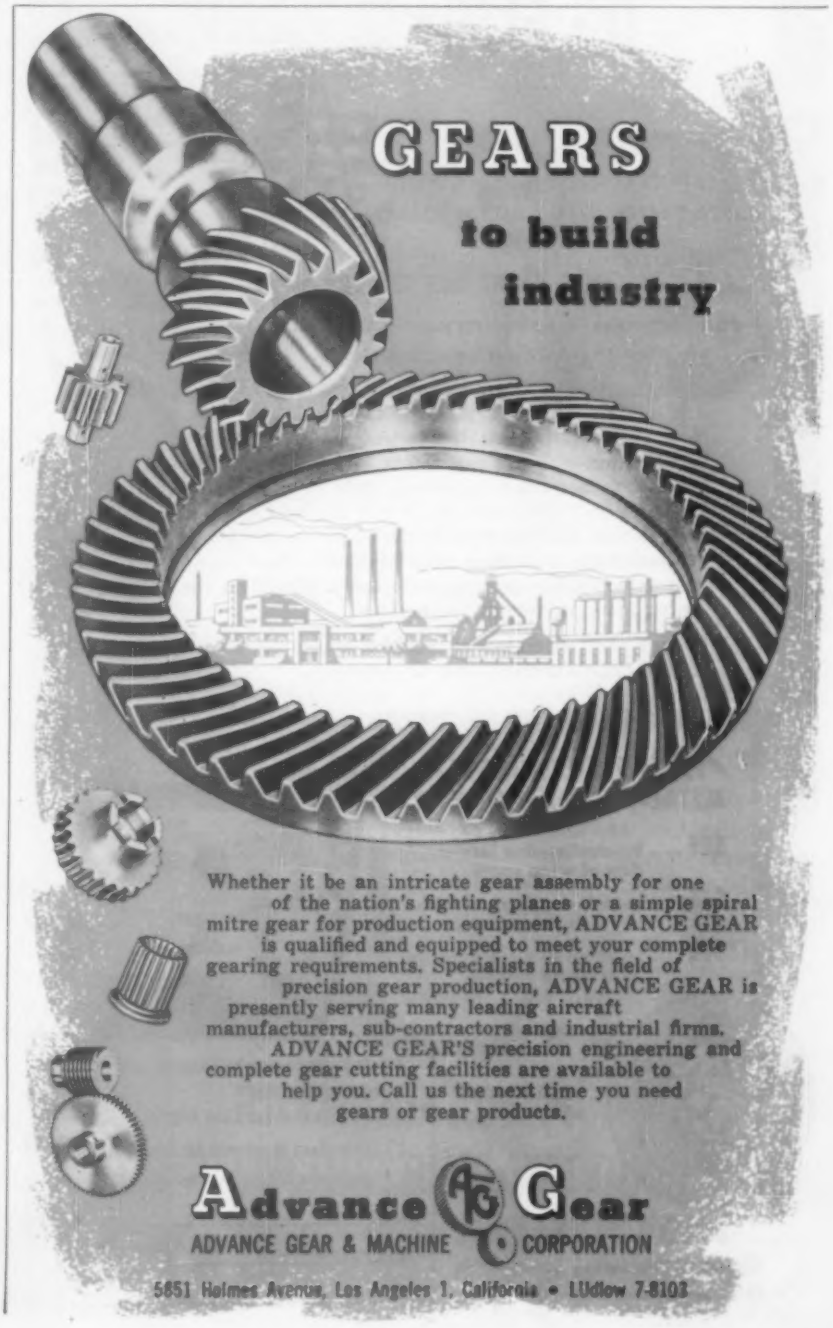
Thomas A. Edison, Inc., West Orange, N. J., military aircraft instruments, $16,912 certified with 65% allowed.

Curtiss-Wright Corp., Wright Aeronautical Div., Wood-Ridge, N. J., research and development, military aircraft, $2,122,000 certified with 60% allowed.

Bell Aircraft Corp., Wheatfield, N. Y., military aircraft, $426,947 certified with 65% allowed.

Lockheed Aircraft Corp., Missile Systems Division, Van Nuys, Calif., research and development, guided missiles, $1,628,937 certified with 60% allowed.

Goodyear Aircraft Corp., Akron, Ohio,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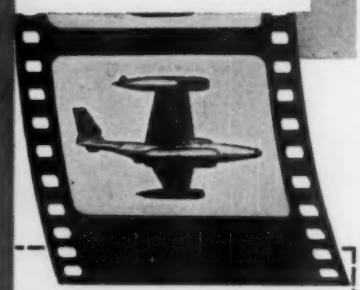

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Ronson Corporation, Newark, N. J., hydraulic assemblies for military aircraft, $3,196 certified with 65% allowed.

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The United Tool & Die Co., West Hartford, Conn., military aircraft engine components, $99,877 certified with 65% allowed.

Magnetic Clutch Improves Torquing

A magnetic-clutch power tool that torques up screws or nuts within a tolerance range of 10% of pre-determined values, has been put in production by Chicago Pneumatic Tool Co.

The new Magnamatic screwdriver, already at work at North American Aviation and Convair, does its job 24 times faster than the conventional method of partially tightening a fastener with a power tool, then applying correct torque with a torque wrench, Guy J. Coffey, company president claims.

Probably the biggest benefit offered by the tool is that it takes the guess work out of torquing fasteners with power tools. With a ratchet-type pneumatic screwdriver, the longer the tool is held on a screw, the tighter the screw gets, because of the clutch's hammering action.

The Magnamatic stops once the desired torque is reached; it will not tighten the fastener further, regardless of how long the operator holds the tool on the screw, Coffey says. It permits desired torque to be applied consistently over high production runs without reliance on operator skill.

Air motor tools can be adjusted to have the motor stall at a predetermined torque (without damage to the motor) by regulating air pressure to the tool. However, Chicago Pneumatic says this system works reasonably well only when screwdriver turns below 500 rpm. Over that speed, erratic variables introduced by the flywheel effect of rotating parts make accurate torquing impossible.

Another benefit, particularly applic-

REGULUS reports back to the Navy via... RREP TELEMETRY

The performance of the Regulus missile, developed and produced by Chance Vought Aircraft for the U. S. Navy Bureau of Aeronautics, is monitored by RREP Telemetering Equipment. Tactical versions of the Regulus are designed for operation from ground stations, from shipboard and from submarines.

Vital in-flight data is accurately transmitted to the telemetry receiving station for both on-the-spot observation and for recording for further analysis.

RREP Telemetry Transmitting Equipment has demonstrated its accuracy, ruggedness, and reliability during the Regulus flight test programs. Test versions of the Regulus, recoverable "birds" fitted with landing gear and parachutes, unique in the missile field, have survived as many as fifteen flights, and RREP Telemetry has been on the job reporting missile performance on every flight.

Technical Bulletins available on request.

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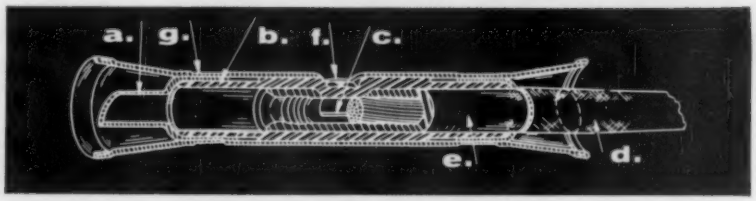

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a. Inner Ferrule
b. Insulation sleeve
c. Inside strap butt connector
d. Shield connecting sleeve
e. Wire insulation passes into inner ferrule, into insulation sleeve and butts against end of strap butt connector and braid passes into space between ferrule and outer shield connecting sleeve.
f. Inspection window
g. Number coded to indicate wire size and braid grip size—tool also coded to indicate use of proper crimp when connector is applied.

A-MP®

Send today for your copy of A-MP's Creative Approach to Better Wiring.

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LIBRASCOPE'S HIGH SPEED

DATA HANDLING SYSTEMS...

made to JUMP TO CONCLUSIONS!

LIBRASCOPE CAN SOLVE YOUR COMPLEX DATA HANDLING PROBLEMS!

Two decades of successful experience in the development and manufacture of computing-controlling equipment for military and industrial applications have provided Librascope with an outstanding capacity for achievement in the field of data handling.

This broad background in mechanical, electrical, electronic, optical and magnetic computer-controlling techniques plus the ability to combine and coordinate them in direct proportion to their effectiveness in specific applications enables Librascope's engineering staff to pin-point the most practical and economical solution to your problem.

Your most exacting requirements can be met at Librascope!

THE LIBRASCOPE #208 DATA RECORDING SYSTEM

FOR EXAMPLE:

This Librascope Data Recording System is a high speed reduction system for the rapid conversion of multiple analog data to digital presentation on punched paper tape, magnetic tape or punched cards. This system, capable of operating at extremely high speed with utmost efficiency, can handle as many as 100 inputs and can be programmed for fast or slow sampling intervals. Designed to provide extreme flexibility in operation, this precise data handling system will accept a wide variety of inputs and is adaptable to any coded decimal or straight binary output. The broad versatility of this equipment permits a multitude of applications to military and commercial projects ranging from wind tunnel recording to the automatic control of industrial processes. For the most direct and effective solution to *your* particular data-handling or data-recording problem, consult Librascope's engineering staff. For further information, write today.

Librascope also manufactures mechanical and optical components for computers and controls. Send for booklet describing the company.

Engineers in search of interesting assignments, security, advancement — contact Mac McKeague, Personnel Director.

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LIBRASCOPE, INC. • 808 WESTERN AVENUE • GLENDALE • CALIFORNIA

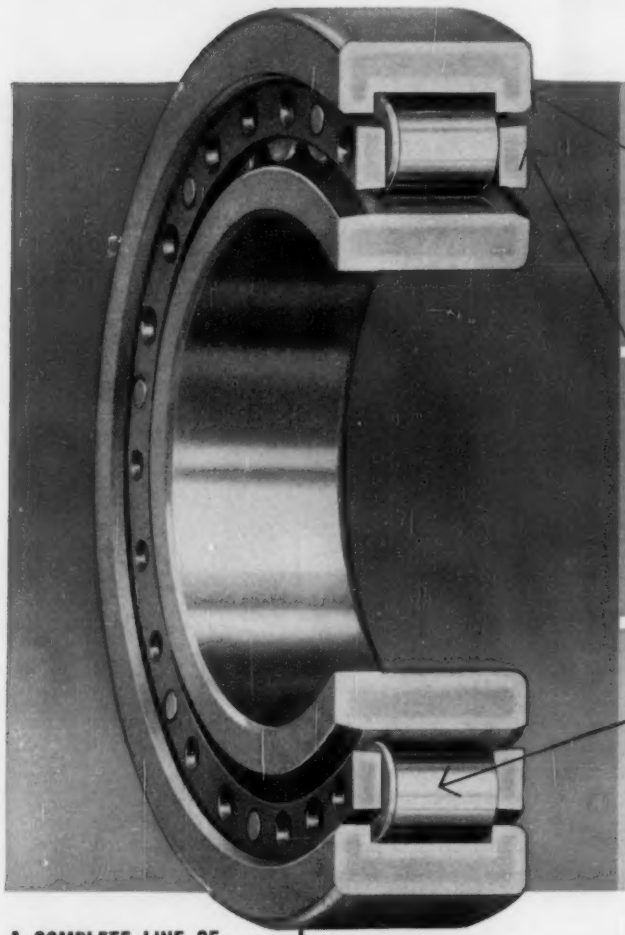
Here's why BOWER straight roller bearings can carry maximum loads—with less maintenance!

The important design features of Bower straight roller bearings shown on this page are just a few of the reasons why these bearings will operate efficiently and economically in your product. Consider these facts, too. Bower straight roller bearings incorporate highest quality materials and workmanship. They have proved themselves capable of standing up day in and day out under maximum loads—with little or no maintenance.

In fact, this is the reason why Bower straight roller bearings are used extensively by leading manufacturers in such fields as automotive, earthmoving, farm equipment and machine tool.

Let a Bower engineer give you full details of the complete Bower line. Call him in while your product is still in the blueprint stage.

BOWER ROLLER BEARING COMPANY • DETROIT 14, MICHIGAN



● ***TWO-LIP RACE INCREASES RIGIDITY.*** These two shoulders, made parallel, are integral with the outer race. This provides a more rigid, durable construction. Rollers are kept in proper alignment at all times.

● ***COMPOSITE STEEL CAGE DOES NOT CONTACT ROLLERS DURING NORMAL OPERATION,*** thereby allowing free movement of the rollers between the races. Projections on the inner faces of the rings engage indentations on the roller ends preventing the rollers from dropping out of position when the separable race is removed.

● ***PRECISION-BUILT ROLLERS AND RACES ARE MADE TO SUPPORT MAXIMUM RADIAL LOADS.*** Only the highest grade steel-alloy is used, and rollers and races are precision ground to give quieter, smoother operation. Running clearance is built in at the time of manufacture.

A COMPLETE LINE OF TAPERED, STRAIGHT AND JOURNAL ROLLER BEARINGS FOR EVERY FIELD OF TRANSPORTATION AND INDUSTRY

BOWER

ROLLER BEARINGS

SPHERO-HONED

able in the aircraft industry, is that the Magnamatic screwdriver allows designers to get all the potential strength out of a screw by torquing it correctly. Thus, smaller and lighter fasteners can be substituted for the screws that now must be used because of the uncertainty of obtaining proper torque on the production line.

Although initial cost of the Magnamatic is 20-30% higher than a conventional pneumatic screwdriver or nut runner, the new tool will bring about considerable savings in labor, parts and maintenance, as well as a reduction in noise, says Coffey.

Here is why:

• **Labor saving.** The tool not only does the job faster, but allows one man to do the job of two—same worker tightens and torques the fastener.

• **Parts economy.** Bits last much longer when used in the Magnamatic, because hammering is eliminated. In a comparison test made by the company over 22 working days, a conventional ratchet-type power tool broke 32 bits compared to a single bit broken by a Magnamatic doing identical work for the same period of time. And the tool reduces work spoilage by making it almost impossible to damage fasteners and surrounding metal.

• **Maintenance reduction.** Severe wear between the two ratcheting faces of the conventional power tool is eliminated. A Magnamatic screwdriver, disassembled after 18 months of constant use, showed no appreciable wear, according to Coffey.

• **Noise reduction.** This is especially noticeable in a sheet metal shop. The new tool does away with the ratcheting clutch whose hammer-action creates a loud clatter when used on resonant sheet. Also, the Magnamatic incorporates a new acoustic baffle which reduces noise of air escaping from the tool.

Chicago Pneumatic puts out five sizes of Magnamatic screwdrivers in 13 models, both reversible and non-reversible. Tools handle screw sizes from #4 to ⅜ in. Torque range of the entire line is from 5 to 150 in. lb.

New Plane Contracts

The Navy has awarded contracts totaling $250,000 to four aircraft companies to make design studies for a new high performance observation reconnaissance plane to be used by the Army and Marine Corps (AW June 27, p. 11).

Cessna Aircraft Co., Fairchild Engine and Airplane Corp., Hiller Helicopters and North American Aviation won contracts for the studies and are to submit final reports by December 31. The successful design is expected to result in a production contract.

USAF Contracts

Following is a list of recent contracts announced by the United States Air Force.

Charles T. Hughes Constr. Co., 21 Northeast 29th St., Oklahoma City, construction of bearing conditioning shop, Tinker AFB, $172,113.

Neale Constr. Co., 3100 Topeka Ave., Topeka, administrative telephone cable expansion and control cable for navigational aids, Chanute AFB, Ill., $72,000.

Allison Div., General Motors Corp., Indianapolis 6, Ind., overhaul of YT56-A-3 and/or components assemblies, 10 ea., $135,000; modification of J33 inner linear assys., 14,500 ea., $51,475.

Thompson Products, Inc., 23555 Euclid Ave., Cleveland 17, Ohio, valve assy., fuel line selector, 3 items, $42,198.

Buckbolts-Transitube Co., 900 Jefferson Tower, Dallas, Tex., pneumatic tube system and extension of existing system, Tinker AFB, $51,418.

Wickers Engineering & Construction Co., 1441 Second Ave., Des Moines 14, Iowa, installation of SCS-51, instrument low approach system equipments, Selfridge AFB, Wortsmith AFB, Bergstrom AFB, $24,386.

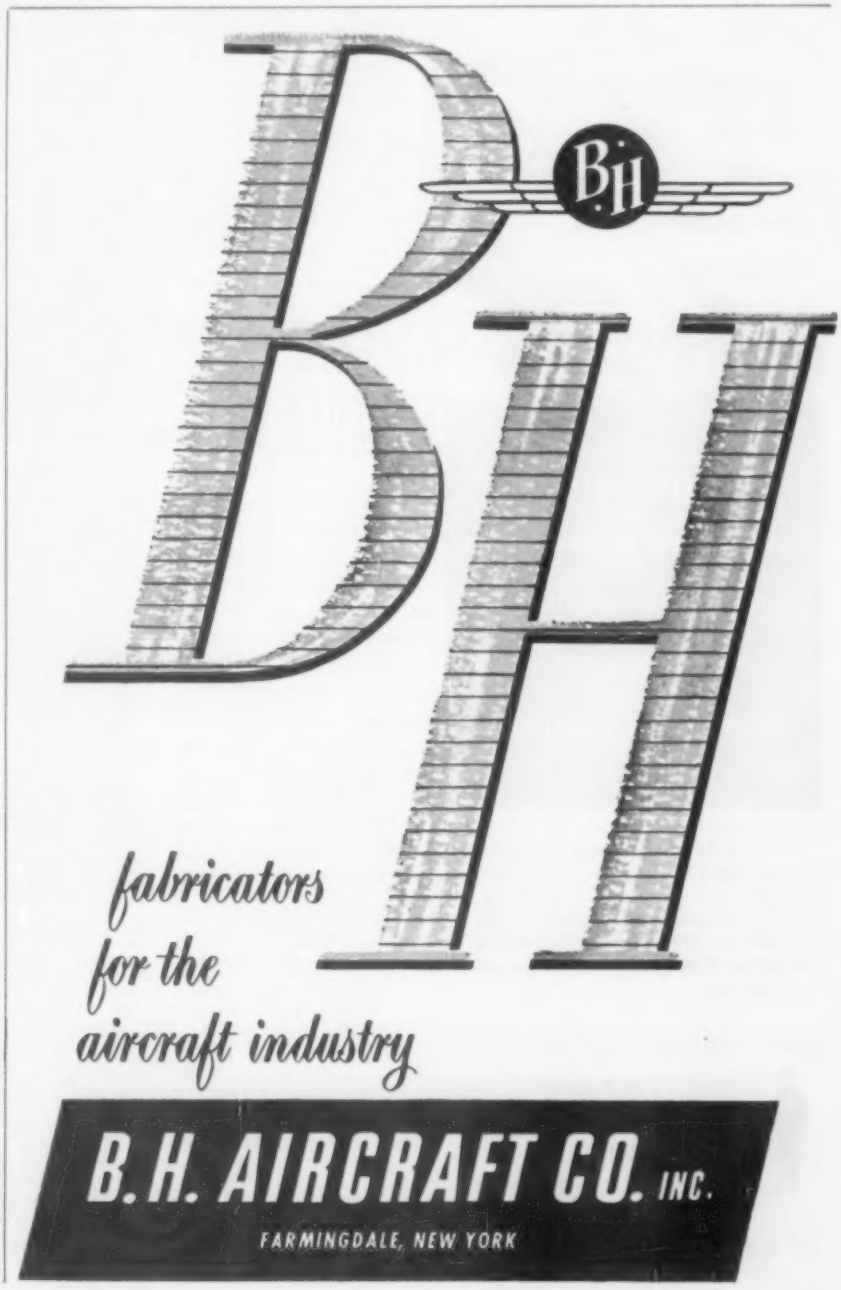
Eastern Rotorcraft Corp., Swamp Road, Doylestown, Pa., tie-down strap, cargo, 2 items, $246,101.

New York Air Brake Co., Watertown Div., Starbuck Ave., Watertown, N. Y., seal assy., hyd. pump shaft, 2 items, $28,400.

Vickers, Inc., 1400 Oakman Blvd., Detroit 32, cylinder pressure control, 30 items, $76,176.

Shaw & Estes & Associates, 1407 South Akard, Dallas, modification of Building No. 210 for installation of pneumatic test accessories shop, Tinker AFB, Oklahoma City, $1,988,170.

Amperex Electronic Corp., 230 Duffy Ave., Hicksville, N. Y., tubes, electron,



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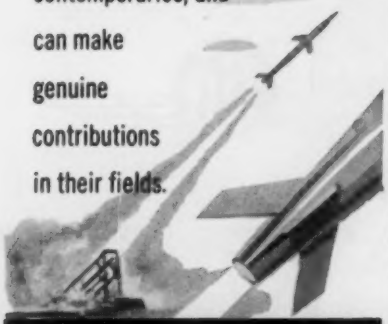
The engineers we're looking for are leaders in their fields. They are able to work far in advance of their contemporaries, and can make genuine contributions in their fields.



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"where the future is measured in light-years"

JAN type No. 4X150A, transmitting tetrode, 18,200 ea., $382,000.

F. X. Minnigan, Inc., 14 Bates St., Dayton 2, construction of building for storage of inflammable materials at Dayton Air Force Depot, $43,157.

Hydro-Aire, Inc., 3000 Winona Ave., Burbank, Calif., switches, tilt, 400 ea., $39,652.

Gilfillan Brothers, Inc., Los Angeles 6, maintenance spare parts for AN/GPN-T2 radar trainer, $198,728.

Curtiss-Wright Corp., Propeller Div., Caldwell, N. J., spare parts for Turbolectric propellers and controls, $75,000.

Beech Aircraft Corp., Wichita 1, hub assys., 240 ea., nuts, 167 ea., bulkhead assys., 34 ea., $141,029.

Ford Motor Co., Dearborn, Mich., J57-F-19W turbojet engines, spares, 98 ea., J57-F-29W turbojet engines, installs., 496 ea., J57-F-21 turbojet engines, installs., 169 ea., $195,572,897.

Central Commercial Co., Chicago, AN/ARA-19 components, $276,016.

Western Electric Co., Inc., New York 13, services and materials necessary to implement a communications system, $4,000,000.

Systems Development, Inc., Binghamton, N. Y., trainer, A-1C gunsight, 35 ea., animated panels, 3 ea., $28,151.

Dayton Plastics, Inc., Dayton, training aid, compass, 50 ea., trainer-demonstrator gyro flux gate compass, 47 ea., $38,425.

Wright-Aeronautical Div., Curtiss-Wright Corp., Wood-Ridge, N. J., gearboxes, 5 ea., 300 ea., $448,314.

Thompson Optical Engrg. Co., Los Angeles 1, window assys., 675 ea., $36,066.

Motorola Inc., Chicago, directional couplers, 82 ea., networks, line balancing, 56 ea., synchronizers, 39 ea., $80,304.

Bill Jack Scientific Instrument Co., Solana Beach, Calif., chassis, amplifier unit, 252 ea., chassis, computer unit, 252 ea., mounting bases, computer, 660 ea., $744,764.

Radio Corp. of America, Engineering Products Div., Los Angeles, radar set, $3,491,159.

General Electric Co., Johnson City, N. Y., spare components and spare part for MD-1 fire control system, engineering liaison B-66 aircraft, $993,837.

Radio Corp. of America, RCA Victor Div., Los Angeles 64, radar, 50 ea., signal/simulator, maintenance spare parts special tools, $302,510.

East Coast Aeronautics, Inc., Pelham Manor 65, N. Y., Aero 27A tow targets, 20 ea., $53,675.

Sperry Corp., Sperry Gyroscope Co., Great Neck, N. Y., sub.-assys. of A-2 flight computer system, $440,389.

Kearfott Co., Inc., Little Falls, N. J., misc. maintenance tools and test equipment, $197,327.

Westinghouse Electric Corp., Dayton, panels, controls, generator, 96 ea., panels, control, 37 ea., $65,491.

Lear, Inc., Grand Rapids, Mich., screwjacks, 533 ea., actuators, 150 ea., $55,325.

Bendix Products Div., Bendix Aviation Corp., South Bend 20, Ind., brake assys. for C-119, 168 ea., $123,453.

Magnavox Co., Fort Wayne, Ind., various components of AN/ARN-6, $3,096,619.

Otis Elevator Co., Electronics Div., Brooklyn 5, N. Y., mod. kits, 2 ea., 2 ea., $362,000.

Goodyear Tire & Rubber Co., Inc., Akron 16, brake assys. for F-84F aircraft, 859 ea., $495,213.

Cook Electric Co., Chicago, relays and data, $30,583.

Motorola Inc., Chicago 14, antenna assys., 54 ea., indicators, range, 63 ea., azimuth radar modulators, 54 ea., $1,896,775.

Medico Electric Motor Co., Inc., 11 Tompkins St., Pittston, Pa., jacks, hand, hyd., 5-ton cap., wing, nose, or tail, tripod folding type B-5, 379 ea., $95,887.

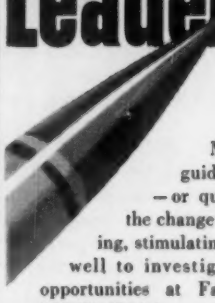
Standard Mfg. Co., Inc., 1332 Canton St., Dallas 2, trucks, bomb lift, type K-3, 8 ea., $480,673.

Frank G. Schenuit Rubber Co., Railroad & Union Ave., Baltimore 11, services to retread 04C aircraft casings, call contract.

United States Rubber Co., 6600 East Jefferson Ave., Detroit 32, services to retread 04C aircraft casings, call contract.

South Western Gear Works, 117 N. Palmer St., Houston 3, bar, pry, wheeled, type MB-1; bar, pry, wheeled, type MB-2; 24 ea., $32,520.

Leadership



Men now in guided missiles work — or qualified to make the change to this challenging, stimulating field — will do well to investigate the career opportunities at Fairchild Guided Missiles Division.

If you can advance beyond your fellow engineers in such fields as these — if you can do original, imaginative work —there is a place for you at Fairchild!

Advanced radars
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7 DAYS
of accelerated heat aging

28 DAYS
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40 PSIG
cycling pressure

63,540
shear misalignment CYCLES (amplitudes thru .50")

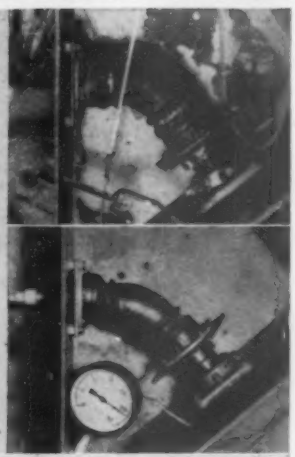
−65° to +160°
temperatures

26" OF MERCURY
negative cycling pressure

PROVES *FLEXIBLE* FLO-FLEX FLUID CONNECTOR

WITHSTAND VIBRATION, FLEXING MOTIONS AND MISALIGNMENT

Exhaustive tests were made subjecting the flexible Flo-Flex Fluid Connector to cycling motions at temperatures ranging from −65° to +160° F. and at various pressures ranging from 60 psig internal pressure to a vacuum pressure of 26 inches of mercury. No leakage or measurable material fatigue was apparent.



NO LEAKAGE! NO MATERIAL FATIGUE!

These are variations of flexible Flo-Flex Fluid Connectors used on aircraft fuel and oil systems. Fluorocarbon lined constructions are available for some sizes.

FOR HANDLING AIRCRAFT FUELS and oils this new flexible Flo-Flex Fluid Connector is the first to answer the problems of vibration, extreme flexing motions and shear axial misalignment encountered in aircraft fuel systems. Exhaustive tests thru temperature ranges of −65° to +160° F. and at pressures ranging from 60 psig internal pressure to a vacuum of 26" of mercury proved there was no measurable material fatigue from these destructive motions.

The Flo-Flex Connector tube is made of rubber impregnated fiberglass with a seamless liner of specially compounded synthetic elastomers. This tube is cured under 2000 psig pressure and the layers of fiberglass and synthetic resins are fused together to make a leak-proof connector to satisfy the requirements of USAF Memoranda Report MCREXP-524-1854 Add. 1 in handling aromatic fuels Mil-H-3136 Type I or Type III.

Flexible Flo-Flex Fluid Connectors are made in all diameters and lengths with various degrees of flexibility, see the various adaptations below. Ends fitted with floating or fixed, bolted or V-band flanges. Flange sealing is by "O" ring seal or integral gasket on flange face.

Write for Engineering Bulletin No. 350 for complete information and design factors.

ARROWHEAD RUBBER COMPANY | *Division of National Motor Bearing Company, Inc.*

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ENGINE SHROUD AND TAIL PIPE *assemblies by Lavelle help keep these Grumman Cats cool, when "full power jet heat" is on. Producing precision components to withstand tremendous stresses at high temperatures and jet speeds, demands the finest in fabrication. Experienced craftsmen, modern fabricating equipment and extensive welding facilities, enabled Lavelle to produce these stainless steel engine shroud and tail pipe assemblies to Grumman's exacting specifications in quantity . . . and deliver them on time!*

This same capacity for efficient, quantity production of intricate parts and assemblies is ready to serve you . . . when you call on Lavelle for your fabricating needs.

A new brochure describes Lavelle's specialized fabricating services. Write for a copy without obligation.

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Navy Contracts

Contracts recently announced by the Navy's Aviation Supply Office, 700 Robbins Ave., Philadelphia 11, are:

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind., carburetors and maintenance parts for various naval aircraft, $33,463.

Goodyear Tire & Rubber Co., Inc., 1144 E. Market St., Akron 16, disks, 1,864 ea., $33,559.

White-Rodgers Elec. Co., 1209 Cass Ave., St. Louis 6, servos, $38,674.

Transitron, Inc., 145 Spring St., New York 12, N. Y., signal generators, 548 ea., $476,868.

General Electric Co., 1407 Locust St., Phila. 2, Pa., maintenance parts used on various units, $44,918.

Jack & Heintz, Inc., 17600 Broadway, Cleveland 1, generators, 2,125 ea., $50,408.

Lewis Engineering Co., 339 Church St., Naugatuck, Conn., indicators, 1,022 ea., $32,329.

Lenoir Wood Finishing Co., 284 E. Harper Ave., Lenoir, N. C., enamel, 15,860 gal., $40,500.

Permanent Filter Corp., 1800 W. Washington Blvd., Los Angeles 7, element, $25,730.

Henry Spen & Co., Inc., 1995 Pitkin Ave., Brooklyn 7, N. Y., spare parts for oxygen trailer, $76,304.

Carbide & Carbon Chemicals Co., 30 E. 42nd St., New York 17, hydraulic fluid, 2,600 gal., $68,706.

Goodyear Tire & Rubber Co., Inc., 1144 E. Market St., Akron 16, maintenance parts used on brake and wheel assys., 2,336 ea., $27,643.

Bendix Products Div., Bendix Aviation Corp., 401 Bendix Drive, South Bend 20, Ind., maintenance parts used on brake assys., $32,135.

Duracote Corp., 350 N. Diamond St., Havenna, Ohio, cloth, fiberglass, $35,381.

Simmonds Aerocessories, Inc., 105 White Plains Rd., Tarrytown, N. Y., tank units, $43,397.

Pioneer-Central Div., Bendix Aviation Corp., Davenport, Iowa, maintenance parts used on oxygen regulators, $120,904.

Sperry Gyroscope Co., Great Neck, Long Island, N. Y., indicators, $396,544.

Lite Mfg. Co., 101 W. 21 St., New York 11, strap assys., 49,632 ea., $519,647.

Hood Rubber Co., 36 Nichols Ave., Watertown, Mass., boots, 6,600 pr., $68,465.

Products Research Co., 2126 Los Feliz Blvd., Los Angeles 39, Calif., compound, $55,675.

BuAer Contracts

The following contract awards of $25,000 and more have been announced recently by the Bureau of Aeronautics, Department of the Navy, Washington 25, D. C.:

Sundstrand Machine Tool Co., Sundstrand Aviation Div., Rockford, Ill., constant speed drives, spare parts, $2,000,000.

Zenith Optical Div., Polan Industries, Inc., Huntington, W. Va., lenses, 200 ea., $73,372.

Avco Manufacturing Corp., Crosley Div., Cincinnati 25, Ohio, MD-1 fire control systems, 61 ea., maintenance tools and test equipment, $5,409,065.

Canadian Commercial Corp., Washington, D. C., spares for depot, 1 ea., $250,000.

Westinghouse Electric Corp., Lima, Ohio, mounting rack assys., 308 ea., transformers, current, 2,002 ea., spares, 1,618 ea., $73,497.

Northrop Aircraft, Inc., Anaheim Div., Anaheim, Calif., window assemblies, 675 ea., $176,500.

Bendix Products Div., Bendix Aviation Corp., South Bend 20, Ind., wheel assys., 819 ea., brake assys., 626 ea., 2,056 ea., $2,576,322.

Air Associates, Inc., Teterboro, N. J., motors, shafts, actuator and data, $41,655.

Mitchell Camera Corp., Glendale 4, Calif., M.P. camera, highspeed, 5 ea., maintenance data, 1 ea., $26,865.

these men know Honeycomb!

They're members of the staff of technicians, chemists and engineers in our research and testing laboratories—they're the men who stand behind Hexcel Honeycomb and Hexcel men in the field. These men are experts in evaluating new adhesives and methods, and in the quality control of Hexcel GLASS FABRIC, COTTON FABRIC and ALUMINUM Honeycomb (flat sheets, pre-shaped forms and tapered sections as required, conforming to applicable Government and aircraft specifications). They also lend their know-how to product and service testing for our customers. If you have a problem, we invite you to phone, write or wire...

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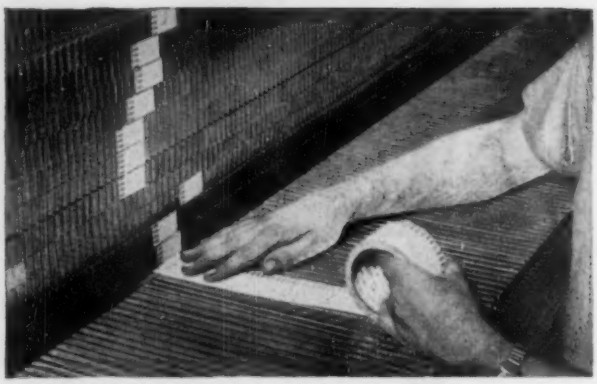
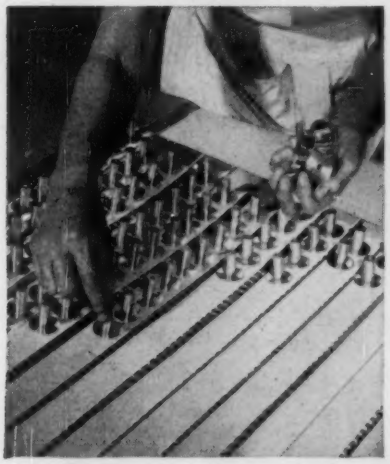
PERMACEL TAPE

ECONOMY IN PRODUCTION of the Martin Matador, new pilotless bomber, is the result of new techniques in which Permacel Tapes are used for a wide variety of cost and time saving applications.



HONEYCOMB "LUMBER" of aluminum, used in new adhesive bonding technique, is marked by Permacel 725 Printed Tape with part No. identification prior to being sawed into various size panels.



PERMACEL 77 Crepe Paper Masking Tape, adhesive side up, holds light-weight aluminum thimbles for adhesive spraying.

ELECTRICAL TERMINALS insulated with Permacel 30 Heavy Duty Plastic Tape for exceptionally high dielectric strength.

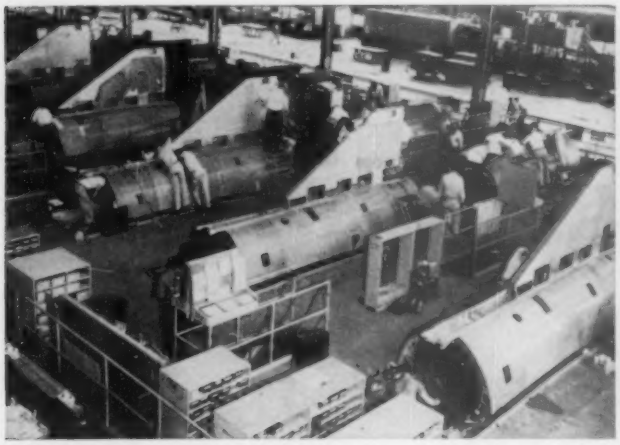
"FLYING COLORS" for all aircraft quickly, easily—by masking paint jobs with Permacel 71 Stain-Resistant Masking Tape.

SELF-STICKING

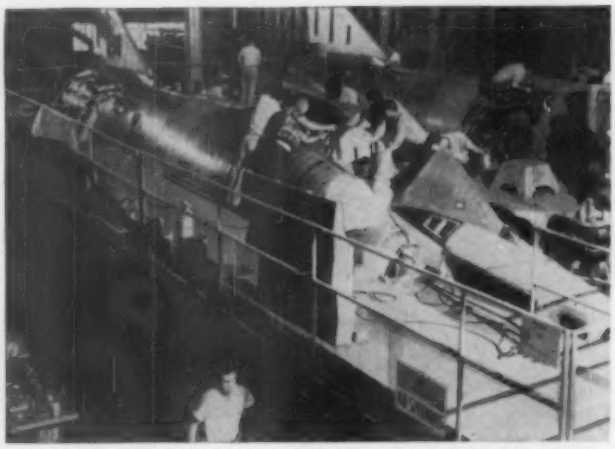
PERMACEL® TAPES

Many jobs can be done faster, better, easier, with self-sticking tape . . . write Permacel Tape Corporation, New Brunswick, N. J.

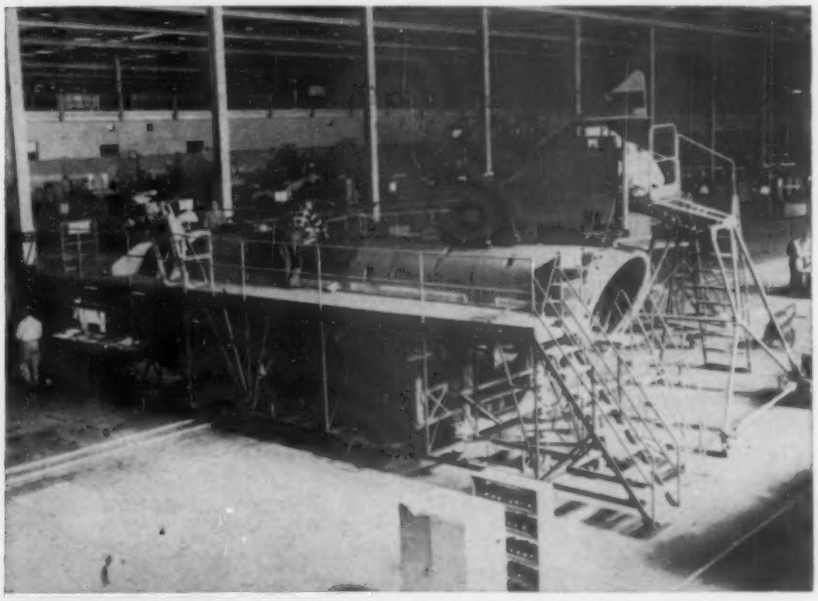
CONVAIR YF-102A is redesigned prototype for production interceptors; changes include lengthened nose, wing camber, new canopy.



FIN and fuselage are connected through four structural members.



FUSELAGE mating joins nose and tail to center fuselage barrel.



F-102A USES COMBINATION skin-duct panels at cockpit, integral ducting aft.

F-102 Production Tempo Quickens

Delivery of the first production Convair F-102A to USAF marks the start of quantity production buildup for the all-weather interceptor.

Ordered under the Cook-Craigie plan, production of the F-102A started slowly, was to stay at low rate while bugs were ironed out in flight test.

Subsequent necessary changes in the aerodynamics of the plane have been made and will be retrofitted on the mininum number of production airframes.

Buildup of personnel and facilities at Palmdale, Calif., has started, to meet F-102A deliveries. Palmdale will do all pre-delivery flight test. New paint job of gray with black and dull green distinguishes F-102A.

From the day that horsepower launched the first plane into the air, oil assumed a role of increasing importance in protecting engines against extremes of heat and friction. And as bigger and faster planes streaked across and between continents, more airlines have come to realize the outstanding dependability of Sinclair Aircraft Oil. For more than 20 years American Airlines has counted on this dependability to help maintain a superb record of scheduled service. Today, 45% of the aircraft oils used by major scheduled airlines in the U. S. is supplied by Sinclair. There is no better proof of dependability.

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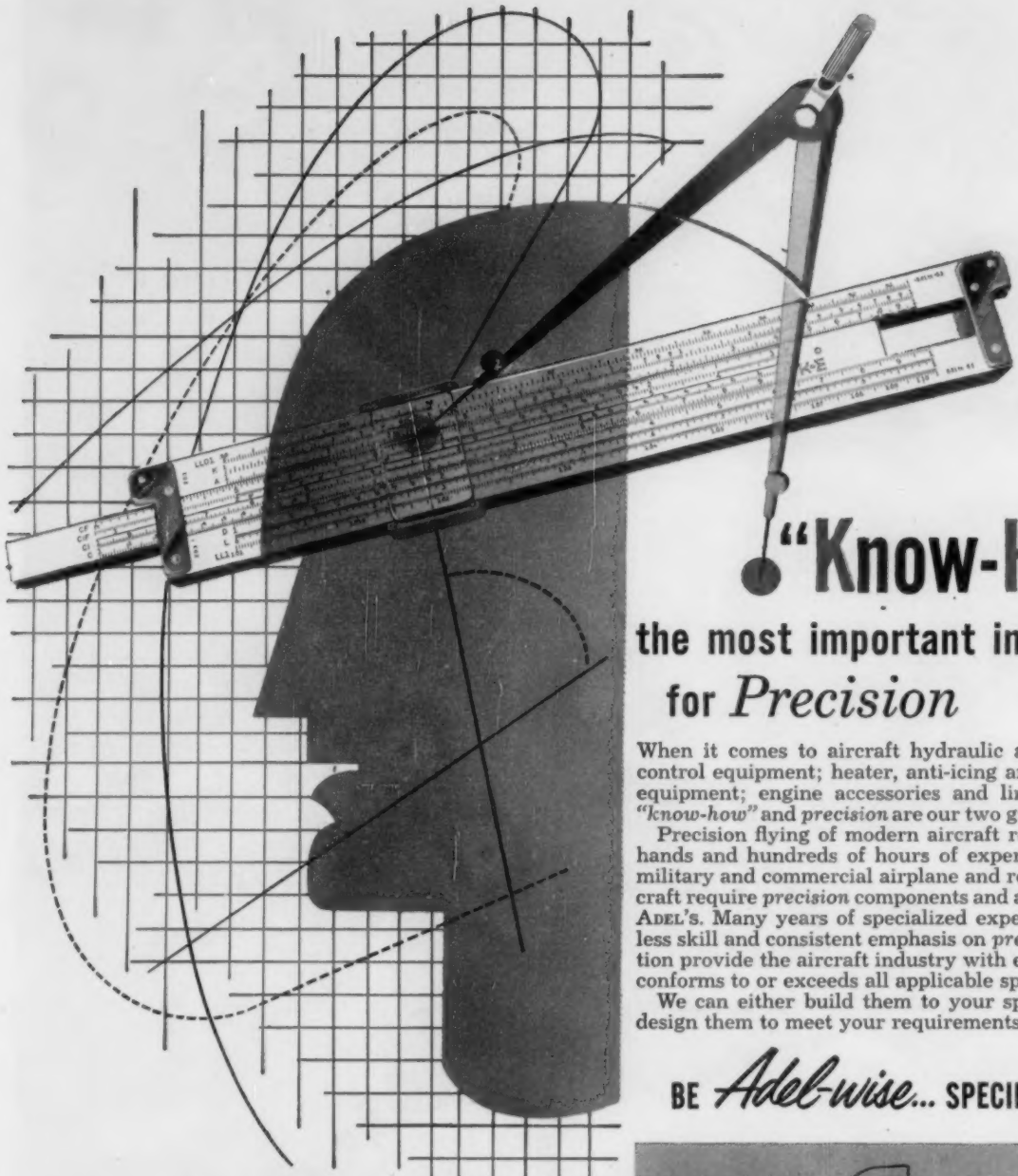

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the most important ingredient for *Precision*

When it comes to aircraft hydraulic and pneumatic control equipment; heater, anti-icing and fuel system equipment; engine accessories and line supports... *"know-how"* and *precision* are our two greatest virtues.

Precision flying of modern aircraft requires skilled hands and hundreds of hours of experience. Today's military and commercial airplane and rotary wing aircraft require *precision* components and accessories like ADEL's. Many years of specialized experience, matchless skill and consistent emphasis on *precision*-production provide the aircraft industry with equipment that conforms to or exceeds all applicable specifications.

We can either build them to your specifications or design them to meet your requirements.

BE *Adel-wise*... SPECIFY ADEL

Hydraulics, Pneumatics and Controls Engineers are urgently needed and offered exceptional opportunities

Write for descriptive Brochure containing detailed information on ADEL's line of Aircraft Equipment and facilities

ADEL

PRECISION PRODUCTS

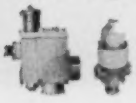
A DIVISION OF GENERAL METALS CORPORATION

BURBANK, CALIFORNIA · HUNTINGTON, WEST VIRGINIA

CANADA: RAILWAY & POWER ENGINEERING CORPORATION, LIMITED

ADEL **designs and manufactures aircraft accessories in the following major categories:**

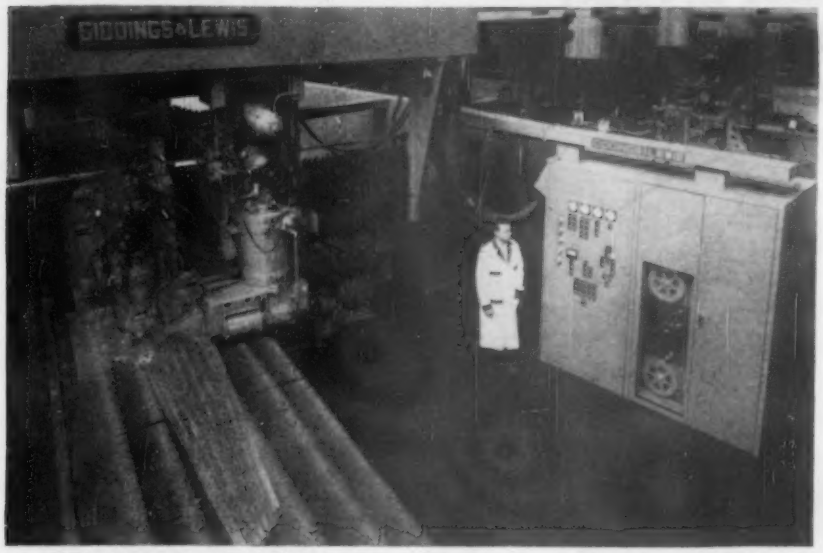
HYDRAULIC & PNEUMATIC CONTROL EQUIPMENT



ANTI-ICING, HEATER & FUEL SYSTEM EQUIPMENT

ENGINE ACCESSORIES

LINE SUPPORTS



BY THE NUMBERS—Taped directions to miller are taken directly from numerical data on blueprints, machine feed rates, etc. F-100D horizontal elevator is shown on table.

Automated Heavy-Duty Production Tools Available to Aircraft Firms

Complete automation of heavy-duty aircraft production machines has moved a step closer, with the announcement by Giddings & Lewis of the commercial availability of their Numericord electronic control system.

Recent demonstration for Air Force and aircraft manufacturing officials showed how Numericord could control a G&L aircraft type spar and skin milling machine. However, the company is also offering other heavy-duty tools, such as horizontal boring, drilling and milling machines, planer type milling machines and vertical boring mills with the new automation system or modifications of it. The tape-controlled spar and skin miller performs all the "plunge," "channel," "pocket" and contouring cuts necessary to mill jet aircraft skin and wing panels from 75ST aluminum plate.

The system is the result of three years of G&L-sponsored research at Massachusetts Institute of Technology and allied research at General Electric.

What It Means

Similiar to the tape-controlled miller being developed by Convair under an Air Materiel Command contract (AW Mar. 28, p. 36), the machine eliminates many steps now required in setting up and controlling a cutting operation. Working from a master tape, it can be operated by semi-skilled operators.

It accurately reproduces, over and over again, a part, merely by rerunning the tape. Production of identical parts by widely separated plants, each operating from a duplicate tape, is possible.

Magnetic tapes can be prepared on a continuous production basis for all machines and jobs in the shop, or in a manufacturer's several plants. Files of tapes can be maintained ready for changing any machine's production from one part to another. Design changes and modifications can be taped ready for later changeover.

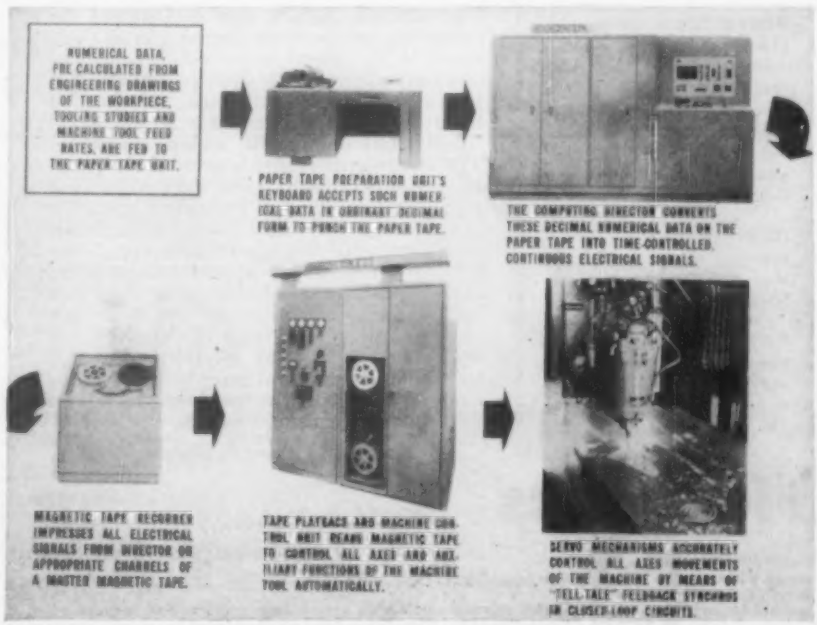
The Numericord system controls machining cycles involving as many as five machine axes and 22 auxiliary machine functions.

It is faster than other automation production, G&L says, because the tape record is made from simple decimal numbers, eliminating translation of these measurements into the binary form other systems require.

How It Works

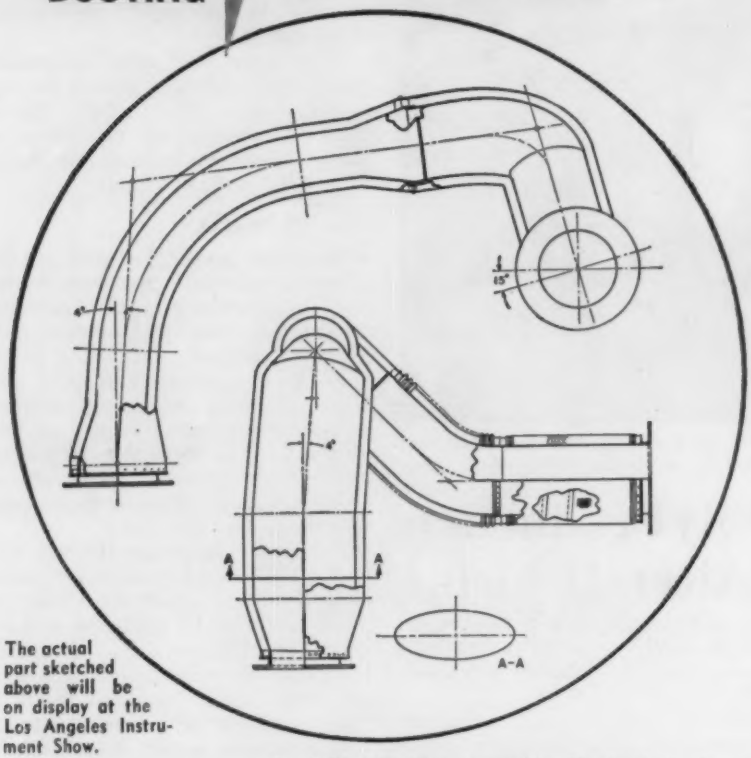
• **Paper tape preparation unit** punches a master numerical tape with decimal information taken from parts drawings, tooling data, and machine feed rates. Special commands are entered in the same fashion, using six auxiliary symbols. Checking circuits automatically determine if command errors have been made, such as exceeding feed rates, wrong time intervals, missing plus or minus signs, etc. Standard engineering-type computers are used.

• **Electronic computing director** converts the tape's information into equivalent command signals on a magnetic tape. The director reads the punched paper tape, line for line, storing information serially in special magnetic memory units. Later commands from the director release this information to secondary memory units or directly to data-coordinating circuits for final impression on the magnetic tape. While the director is processing one group of commands, following groups are being read


NUMERICAL DATA, PRE CALCULATED FROM ENGINEERING DRAWINGS OF THE WORKPIECE, TOOLING STUDIES AND MACHINE TOOL FEED RATES, ARE FED TO THE PAPER TAPE UNIT.
PAPER TAPE PREPARATION UNIT'S KEYBOARD ACCEPTS SUCH NUMERICAL DATA IN ORDINARY DECIMAL FORM TO PUNCH THE PAPER TAPE.
THE COMPUTING DIRECTOR CONVERTS THESE DECIMAL NUMERICAL DATA ON THE PAPER TAPE INTO TIME-CONTROLLED, CONTINUOUS ELECTRICAL SIGNALS.
MAGNETIC TAPE RECORDER IMPRESSES ALL ELECTRICAL SIGNALS FROM DIRECTOR ON APPROPRIATE CHANNELS OF A MASTER MAGNETIC TAPE.
TAPE PLAYBACK AND MACHINE CONTROL UNIT READS MAGNETIC TAPE TO CONTROL ALL AXES AND AUXILIARY FUNCTIONS OF THE MACHINE TOOL AUTOMATICALLY.
SERVO MECHANISMS ACCURATELY CONTROL ALL AXES MOVEMENTS OF THE MACHINE BY MEANS OF "TELL-TALE" FEEDBACK SYNCHROS IN CLOSED-LOOP CIRCUITS.

COMPONENTS of Giddings & Lewis Numericord system of machine tool automation.

FLEXON INSULATED DUCTING combines circular, elliptical and flexible sections



The actual part sketched above will be on display at the Los Angeles Instrument Show.

Check *FLEXONICS* for any of these components

FLEXON DUCTING, standard or high strength corrosion resistant, is available in varying wall thickness in light gauges and in a complete range of sizes, with or without insulation. Elbow forming and rib reinforced types can also be supplied in Type 321 and Uniloy 19-9DL.

FLEXON METAL HOSE, corrosion resistant, is manufactured in the broadest varieties of sizes and types for all aircraft applications.

FLEXON BELLOWS are made in an almost unlimited range of sizes and types to meet the most advanced requirements.

The ducting assembly illustrated above is typical of many intricate sections developed and fabricated by Flexonics to meet the rigid demands of high performance aircraft.

This particular unit is made for a new high altitude fighter and is designed for operating temperatures up to 760° F. Unusual in its design is the combination of circular, elliptical and flexible sections. To provide required uniformity, it is formed from Flexon straightwall stainless steel tubing, not half shells, welded together. The entire unit is insulated and the insulation sealed in a stainless steel outer shell to prevent wicking of volatile fluids.

Flexonics Corporation's ability to fabricate ducting of this type results from over 53 years' experience in the manufacture of flexible metal components. Put this know-how to work for you . . . it is your best assurance of getting the quality you need in your ducting requirements. For specific recommendations on the resolution of your ducting problems send an outline of your requirements.

Flexonics *Corporation* AIRCRAFT DIVISION

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FORMERLY CHICAGO METAL HOSE CORPORATION

Flexon identifies products of Flexonics Corporation that have served industry for over 53 years.

Manufacturers of flexible metal hose and conduit, expansion joints, metallic bellows and assemblies of these components.

In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

into it to assure continuous motion of the machine on playback of the finished tape. The tape preparation and electronic director units are independent of the rest of the system and may be located away from the shop area.

Inherent accuracy of the magnetic tape is better than .0005 in., permitting machining accuracy within .001 or .002 in., G&L says.

Spoken commands are easily included on the tape. These can be used to warn the operator of approaching inspection stops and completion of the machining cycle. If a machining program is interrupted by tool breakage, the operator returns the tape to its last stop signal, retools, and restarts the system's tape readers. Automatic control resumes at that point and continues to the end of the cycle.

• **Electronic playback circuitry,** which reads signals off the magnetic tape and sends commands to the machine.

• **Electro-mechanical control units,** which position the machine's axes in accordance with electronic commands. Precision control of machine cutting heads is accomplished through sensitive electric motors. Continuous electric signals, operating in closed-loop circuits with the machine's tape-reading heads, report on the position of the various tool heads. Discriminators continuously compare the input and output signals, balancing out differences to make sure that the cutting heads are exactly where the tape wants them to be.

Flexible System

The Numericord system may be used in several ways, in addition to operating on numerically controlled tapes.

For instance, the machine control portion of the system may generate its own tapes by magnetically recording tool head travel over a template. Or a recorded tape may be produced by

New Aero Dictionary

A new aeronautical dictionary, reflecting best current usage of terms peculiar to aviation, is being compiled by the National Advisory Committee for Aeronautics under the direction of Dr. Frank D. Adams, an experienced lexicographer. Publication is expected in 1957.

It will be the first such publication by NACA since its 1941 edition of Report 474, Nomenclature for Aeronautics, originally issued in 1934.

Preferred usage will be indicated, but established usage—even though less desirable—will also be included.

NACA had received many requests for a revision of Report 474; the official request came from Dept. of Defense.

THE SLEEK NEW USAF MARTIN B-57 TACTICAL BOMBER IS EQUIPPED WITH THE ARO 5 LITER LIQUID OXYGEN CONVERTER

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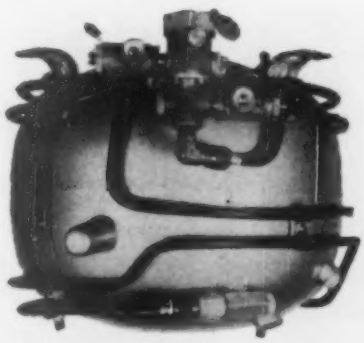
LEADS THE WORLD IN OXYGEN EQUIPMENT

Another ARO FIRST! The new 5, 8 and 20 Liter Liquid Oxygen Converters developed by ARO trim the space-and-weight load in fighters and bombers . . . for example, crew oxygen increases by 75% over equivalent gaseous oxygen supply at no expense in weight. Complete technical and engineering data available on request.

This is typical of many ARO contributions to aviation progress . . . with world leadership in the design, development and manufacture of oxygen equipment. Leading aircraft builders today depend on Aro for a growing number of precision products. For further details write:



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Liquid Oxygen Converters, Oxygen Regulators, Pressure Regulators, Contents Gauges, Relief Valves "Anti-G" Valves, Air and Oxygen System Accessories, Actuating Cylinders, and other Aircraft Accessories.

*ACCURACY 1% of ACTUAL READING (not full scale)

Sensing and Servo devices supplied by GIANNINI as separate components† for many similar applications during the past few years, have now been combined into complete, integrated, AIR DATA Systems to bring new standards of accuracy, performance, and reliability to the in-flight determination of important parameters. Systems for TRUE AIR SPEED, MACH NUMBER, MACH CONTROL, PRESSURE RATIO, ANGLE of ATTACK, etc., can be modified to fit particular applications. Inquiries relative to specific requirements are invited.

†*Most operational U. S. military aircraft and missiles use one or more Giannini Instruments. (Pressure Transmitters, Potentiometers, Accelerometers, Vanes, Gyros.)*

*TYPICAL SPECIFICATIONS:
MACH RANGE: 0.35 to 2.3; or 0.5 to 3.0
RESPONSE: Approx. 3.5 cps Servo
ACCURACY: ±1%
RESOLUTION: 0.33% Average
OPERATING RANGE: S. L. to 80,000 ft.

G. M. GIANNINI & CO., INC.
918 E. GREEN ST., PASADENA, CALIFORNIA
580 FIFTH AVE., NEW YORK 36, NEW YORK
8 S. MICHIGAN AVE., CHICAGO, ILLINOIS

having an operator put the machine through simulated machining motions in a "dry run," or having him actually produce the initial part. Synchros, attached to the feed drives, record the entire machining program, at the same time eliminating non-cutting intervals of more than 20 seconds from the tape, so machining is more or less continuous when the tape is played back later.

Giddings & Lewis use standard, commercial components, with established reliability, in the Numericord. Most of the electronic circuits are printed. Vacuum tubes are computer quality, re-rated for long life and set in plug-in boards for simplified checking and maintenance.

PRODUCTION BRIEFING

► **Fibre glass fabric reinforcement** in abrasive cutting-off wheels provides a high safety factor up to speeds of 16,000 sfm., according to Carborundum Co., Niagara Falls, N. Y. Wheels show a flexural strength index of 7,000 and impact rating of 400 ft. lb./sq. in., providing a burst speed of up to 40,000 sfm., compared with about 20,000 sfm. for unreinforced wheels and 27,000-32,000-sfm. for wheels reinforced with other man-made fabrics, the company reports.

► **New method for coring** intricate passageways in a casting without resorting to use of metallic tubular inserts or costly machining, is said by Hills-McCanna Co., Chicago, to offer high potentials to the aircraft engine and landing gear industries. Process, called McCannacore, is based on use of a rigid coring material fabricated to the desired shape, the material being removed from the casting by a chemical process.

► **North American Aviation, Inc.,** Los Angeles, Calif., has been cited by U. S. Atomic Energy Commission for accomplishing more than 1 million man-hours of injury-free work in the nuclear energy field.

► **Almost half of all electronic** equipment now produced is purchased by the Defense Department, according to Frank D. Newbury, Assistant Secretary of Defense.

► **Initial success** in developing cemented oxide-base cutting tool material is reported by Carboloy Department, General Electric Co., Detroit, Mich. Still in the laboratory stages, the material is said to provide good tool life at 2,000-fpm. speeds. At 0.005-in. feed and depth cut of 0.100-in. at that speed, the tool lasts 27 min. in machining 1045 steel annealed to 170 Brinnel, Carboloy states. The new material is brittle, requiring special understanding of its use, but the firm's engineers feel that it will supplement carbides.

► **World's largest reinforced plastic press** is what Hydraulic Press Manufacturing Co., Mt. Gilead, Ohio, calls 600-ton-capacity unit it has built for Zenith Aircraft, a Division of Zenith Plastics Co., Gardena, Calif. Platen size is 75x104 in.

► **Greer Hydraulics, Inc.,** Jamaica, N. Y., has opened new and larger offices at 6736 Lankershim Blvd., N. Hollywood, Calif., in charge of Ernest O. Gibson, Jr.

► **National Co., Inc.,** Malden, Mass., electronics manufacturer, has leased additional area in Melrose, Mass., and moved its physics and pulse devices laboratories to this location.

► **Four 1-lb. slabs of Cobalt 60** have been shipped by Brookhaven National Laboratory, N. Y., to B. F. Goodrich Research Center, Brecksville, Ohio, for use in rubber and plastics studies. Cobalt in the package to be used by Goodrich is said to give off radiation comparable to that provided by 1,500 grams of radium.

► **Titanium brazing process** that operates with lower-than-normal brazing temperatures requires no fluxes and permits simultaneous multiple brazing operations, Stainless Steel Division of Wall Colmonoy Corp., reports. The Detroit firm states that the process is applicable to any-size assemblies and avoids embrittlement generally encountered in joining titanium.

► **Nopco Chemical Co.,** Harrison, N. J., anticipates a 25,000% increase in use of foamed plastics in the next five years, and accordingly has authorized a $1-million expansion program to increase plastics activities in urethane and vinyl foams. Firm will build a new plant in New Jersey and Los Angeles this year and is planning a third.

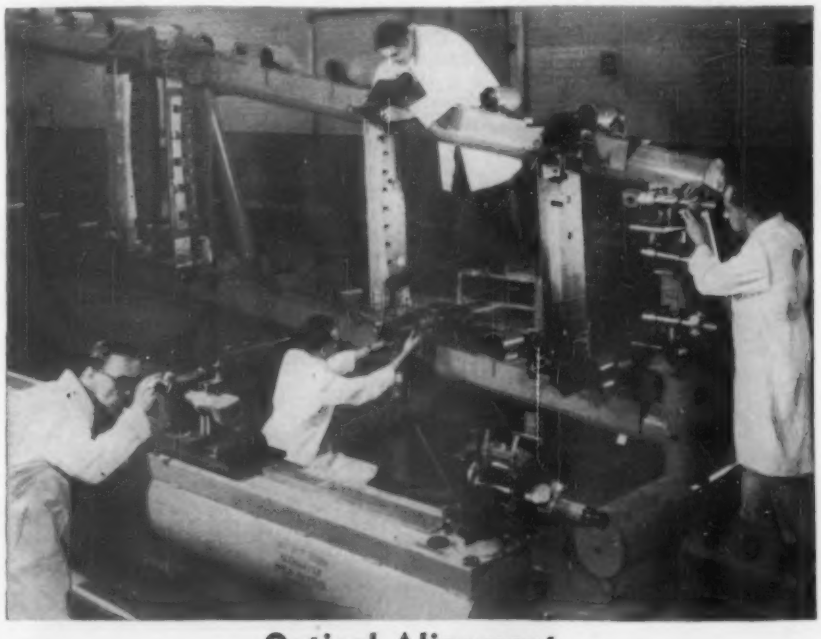
► **Canoga Corp.,** Van Nuys, Calif., has added 65,000 sq. ft. to its present facilities. Firm specializes in radar equipment.

Iron-Steel Markings To Be Standardized

Uniform markings on selected iron and steel products are required by the Defense Department under terms of Military Standard 183, to be distributed to industry about Aug. 1.

Marking will include manufacturers name or trademark and the composition and condition designators commonly used. They will be applied to the product by the producing mill.

Purpose of the standard, according to the office of Thomas P. Pike, Assistant Secretary of Defense for Supply and Logistics, is to provide positive identification, cut down on mixed steels and facilitate reallocation of existing stocks and supplies.



Optical Alignment

Canadair tooling technicians use optical techniques for establishing alignment and fixed points on jig for CL-28 wing panel. Canadair is building the CL-28, overwater reconnaissance version of the Bristol Britannia long range transport for the RCAF.

American Electric Model EPM-1123

400 Cycle Laboratory Power Supply

An Electroflow product.

This model, one of the many American Electric power supplies in production, is designed primarily for portable, laboratory quality, 400 cycle requirements. A 115/200 volt, 3 phase output of from ½ to 5 KVA capacity is available in various models with voltage regulation within ±1% and with voltage adjustment of ±10%. These units are powered from any 220/440 volt, 3 phase, 60 cycle supply.

ALL CIRCUITS PROTECTED — Input circuit is equipped with a 60 cycle circuit breaker and motor starter. Output circuit is protected against both current and voltage surges with a circuit breaker and over-voltage relay.

METERING — 400 cycle instrumentation includes a voltmeter, ammeter, frequency meter and a selector switch by which each phase may be checked individually.

COMPLETE INTEGRATION — This rubber tired unit contains the complete system—American Electric Inductor-type Alternator (no wearing parts), electronic exciter and voltage regulator, complete instrumentation and two output connectors for multiple loads.

MANY OTHER SIZES — American Electric Power Supplies are available in many high cycle variations...from ½ to 75 KVA, fixed or variable frequency, portable or stationary designs.

WHATEVER YOUR HIGH CYCLE POWER REQUIREMENTS — There's an American Electric model for your immediate needs. *Ask for details!*

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American Electric Motors, Inc.
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2112 Chico Avenue, El Monte, Calif.

LETTERS

Landing Light Battle

I am a patient man, but there is a limit to human endurance and H. J. Cory Pearson's letter on pages 79 and 81 of the June 31st issue of AVIATION WEEK finally lit my fuse.

Although very reluctant to engage in literary brickbat throwing or mud slinging, Mr. Pearson's letters, and particularly the last two, display such utter disregard for facts, that lest the uniformed be misled, some corrections are in order.

► **Jess Sweet's Role**—Mr. Pearson has been called the inventor of slopeline lights. I have never heard him deny this, but it has been my impression from years back that the inventor of the slopeline lights was Jess Sweet.

In fact, I and others within airlines were given our first introduction to the slopeline light theory by Mr. Sweet in the attic of the Commerce Building, Washington, D. C., where he had assembled a working model of such lighting.

Mr. Pearson has stated that there was near unanimous agreement on slopeline approach lighting among pilot participants in tests at the Experimental Landing Station at Arcata and that the only dissenting voice was the ALPA representative.

► **Other Dissenters**—This is far from the truth. It happened that I, as ATA representative, was a consistent and strong dissenter, as well as other pilots who participated in the tests.

Mr. Pearson perhaps has forgotten testimony of Southwest Airlines' pilot representative that they preferred the centerline lights to the slopeline.

Due to the biased nature of information coming out of Arcata (information which was under the direction of Mr. Pearson), it was necessary that the ALPA representative or the ATA representative be present and participate in all test activities.

Our observations and reports were quite at variance with what Mr. Pearson would like to have everyone believe and, in fact, we found the slopeline system to be completely inadequate and under some weather conditions, hazardous.

In an attempt to correct some of the deficiencies of the slopeline system, lateral bar lighting in various forms was added, and lastly, the individual light units were red filtered to help differentiate from runway lighting.

When red filters were placed over the light sources a loss of 60 to 80% resulted and the system obviously became a low intensity system.

These drastic corrective measures were not effective in overcoming the deficiencies which were basic and inherent in the slope-

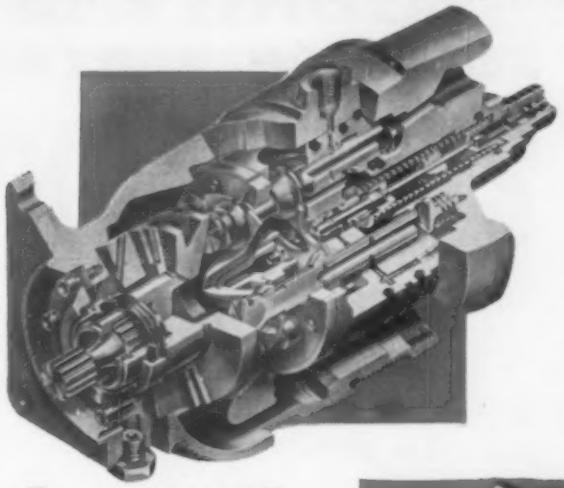
Aviation Week welcomes the opinions of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, Aviation Week, 330 W. 42 St., New York 36, N. Y. Try to keep letters under 500 words and give a genuine identification. We will not print anonymous letters, but names of writers will be withheld on request.

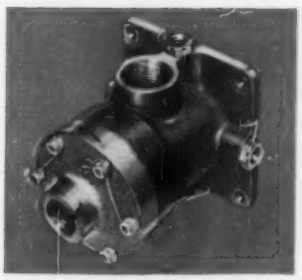
STRATOPOWER

HYDRAULIC PUMPS for the AIRCRAFT INDUSTRY

SERIES 66W
VARIABLE DELIVERY PRESSURE COMPENSATED TYPE REGULATOR

Designed to operate at service altitudes without reservoir pressurization. These pumps meet or surpass the requirements of Specification MIL-P-7740A. They are self-priming and accommodate inlet pressures to 80 psia. Nominal deliveries of 0.25 to 10 gpm. Speeds to 10,000 rpm on smaller sizes. Continuous pressures to 3000 psi.



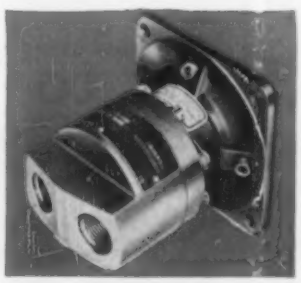


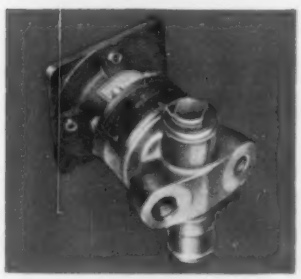
SERIES 66
FIXED DISPLACEMENT

For use at higher service altitudes without reservoir pressurization. Inlet pressures to 80 psia. Nominal deliveries of 0.5, 1 and 2 gpm.

SERIES 67
FIXED DISPLACEMENT

Over thirty models include nominal deliveries of from 0.25 to 3 gpm. Pumps of the 0.5, 1, 2 and 3 gpm sizes have AN approval under MIL-P-7850.



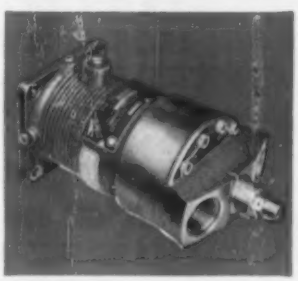


SERIES 67V
VARIABLE DELIVERY INLET FLOW REGULATOR

The most direct known method of integral maximum pressure regulation. Capacities range from 0.85 to 3 gpm, over two dozen different models.

SERIES 67W
VARIABLE DELIVERY PRESSURE COMPENSATED TYPE REGULATOR

Fluid delivery instantly varied in response to system demands. Five sizes from 2 to 10 gpm, forty different models.



SERIES 67MW
VARIABLE DELIVERY DUAL PRESSURE SERVO CONTROL

Selective operation in either of two pressure ranges. Hydraulic or electrical pilot control. Adaptable to 66W or 67W Series Pumps.

SERIES 167
ELECTRIC MOTOR DRIVEN UNITS

For use in boost, utility or emergency circuits. AC or DC electric motors for both continuous and intermittent duty operation. Any combination of electric motor and STRATOPOWER Pump.

CAPACITIES: Rated at 1500 rpm.
MAXIMUM CONTINUOUS SPEEDS: 3750 rpm.
MAXIMUM INTERMITTENT SPEEDS: 4500 rpm.
OPERATING PRESSURES: Continuous duty to 3000 psi.

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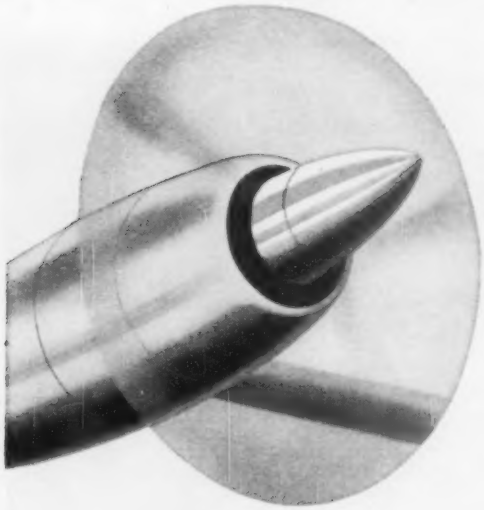

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Propellers make possible:

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85 to 90 percent propulsive efficiencies are provided by the engine-propeller combination at cruising speeds to over 500 mph.

LOWEST FUEL CONSUMPTION

The propeller-engine combination operates at a 30 to 50 percent lower fuel consumption rate than comparable jet powerplants.

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Propeller driven aircraft will take off in two-thirds the runway distance and will have 50 percent steeper climb.

REVERSE THRUST FOR SHORTER LANDINGS AND CONTROL ON WET OR ICY RUNWAYS

The reverse thrust feature offered by propellers reduces landing run by 50 percent, also makes possible safe stops on wet or icy runways.

USE OF EMERGENCY AIRPORTS

Propellers enable transport aircraft to get in and out of small fields, if necessary, providing an extra safety factor for the passenger.

LESS NOISE

The lower tip speed and higher activity factor of new propeller designs reduces noise around airports and means quiet, comfortable airline travel.

LONGER RANGE

High propulsive efficiency and low fuel consumption makes possible long range, non-stop flights at high speeds.

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Short, fast take-offs, rapid cruise, short landings and easy ground handling provide faster block to block operation for propeller driven aircraft.

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for modern subsonic transports and

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for the subsonic, transonic, and supersonic turboprop transports of today and the future.

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line system, as E. S. Calvert has so often and clearly pointed out.

► **Slopeline Crash**—An installation of the slopeline lights was made at Los Angeles and within approximately one week a USAF C-47 misunderstood or misinterpreted the lights and landed between the slope lights; the aircraft burned but passengers, however, were evacuated without injury.

The records at Los Angeles, Washington, and Idlewild are full of near crackups due to pilots mistaking the slopeline lights for runway lights. Fortunately, they were able to pull out in time, though many came very close to crackup.

Another very bad deficiency in the slopeline was that if both rows of the approach lights were visible the pilot received the very strong impression that he was making a too steep descent or that the runway was tilted uphill. This kind of impression is **very** dangerous under lower visibility conditions.

► **Confusing Picture**—Another trouble, common to all two-row systems, was that under really low visibility conditions both rows could not be seen simultaneously and during Arcata tests very often one row would be picked up without knowing whether it was the right or left row and would be flown as a single row system.

Several times pilots mistook the right-hand row for the left. There was a clump of tall trees adjacent to the right side and it was necessary for GCA to advise pilot to pull up as he was headed for the trees.

Mr. Pearson is not a pilot, nor does he understand the basic fundamental fact that a pilot, on transition from instrument to contact flight, does not have **time**—I repeat, **TIME**—to sort out and interpret a lot of confusing and, at times, misleading signals. The information provided to the pilot in the form of visual aids **must** be natural and insofar as possible closely simulate visual clues which he normally receives in contact approaches.

Much more could be said on the deficiencies of the slopeline system, but as Mr. Calvert so aptly put it in the Apr. 11th issue, "the slopeline system has been rejected by pilots all over the world, and not by a 'small and unrepresentative group'."

Mr. Pearson stated in the June 13th letter, and I quote therefrom, "Mr. Calvert, apparently, is not free from an evident and marked bias on approach lights. He, himself, has developed a pattern which is a modification of the centerline with a series of horizontal cross bars. He is also somewhat less than frank in stating that no accidents have occurred on approaches on centerline patterns with cross bars.

"It was reported that several crashes occurred on approaches on this pattern at Berlin during the airlift, and at Newark a very embarrassing test approach on the full ALPA centerline pattern, complete with condenser discharge fancy frills, plowed up the marsh mire a couple of hundred feet to the left of the approach on Oct. 16, 1951."

I am quite sure Mr. Calvert is capable of answering Mr. Pearson in regard to the Berlin Airlift; however, I, personally, do not know of any accidents on Mr. Calvert's centerline cross bar system during the airlift.

► **Newark Accident**—As to Newark, the accident occurred on May 21, 1951 at approximately 0408 EST, not Oct. 16, 1951. Aircraft was an airliner on scheduled arrival

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Simpler in design . . .

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Weight only 0.062 lbs. . . . only one moving part . . . no mechanical linkages . . . hermetically sealed elements for long life . . . that's the quick story of this new Revere F-8300 fuel tank float switch.

Heart of the switch is the Revere sealed-in-glass, magnetically actuated Glaswitch®, potted in an aluminum tube. Around this stem is the float, molded of a new lightweight, non-absorbing, closed-cell material. Buried in the float are permanent magnets which actuate the switch.

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This is just one of many float switches, flow switches, fuel indicating switches, fuel flow transmitters and similar fuel system control devices designed and manufactured by Revere Corporation of America for leading aircraft manufacturers. Engineering assistance gladly offered.

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In aircraft water tanks, for automatic fill control

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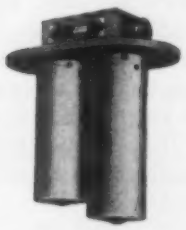

Ask for Engineering Bulletins 1050 and 1051, on new Revere single and dual float switches.

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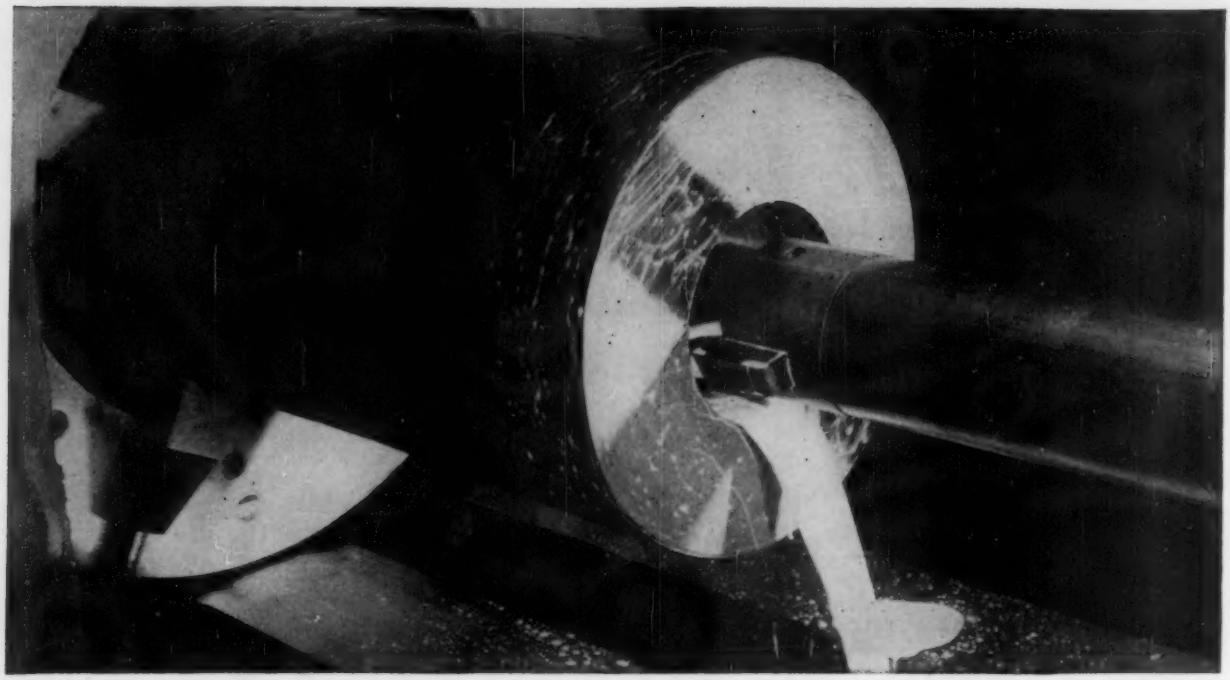

TIMKEN® seamless steel tubing saves steel, machining time!

FINISH boring is your first production step when you use Timken® seamless steel tubing instead of bar stock for your hollow parts jobs. You don't have to bore out the center hole. With Timken seamless tubing, it's "built-in"! So screw machine stations are available for other jobs. You add machining capacity without adding machines.

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To save you even *more* steel, the Timken Company's engineers will study your problem and recommend the most economical tube size for your hollow parts job—a size guaranteed to clean up to your dimensions.

Timken seamless tubing results in a better quality product, too. The piercing operation by which Timken tubing is made is basically a forging operation. This gives the tubing a uniform spiral grain flow and a refined grain structure that brings out the best in the quality of the metal. And this quality is uniform from tube to tube and heat to heat, due to the Timken Company's rigid quality control. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

and not a test aircraft. According to testimony at the CAB hearing, the captain saw the lights well off to his right and he leveled off but did not change power setting which caused aircraft to settle rapidly; full power was applied when aircraft was dangerously low and almost simultaneously contact was made with the swamp. The resulting bounce made the second ground contact on the airport proper which was terminated in a landing along side the runway.

On this particular morning, I participated in 15 test approaches and landings at Newark for purposes of approach light research. As a matter of further information, there has never been an accident involving a low visibility test landing at Newark and some of these landings were made in 400 foot visibility.

Mr. Pearson would like to have it appear that condenser discharge lighting as contained in the Newark centerline system is a frill.

Again, the many pilot users belie his words.

▶ **Condenser Discharge Lights**—The pilots consider the sequenced flashed condenser discharge lights as the heart of the system and of at least equal importance to other components of the centerline system.

The condenser discharge lights provide early identification and reassurance of alignment far in excess of any which can be provided by fixed steady burning lights and actually, in point of time, four to nine seconds before fixed steady burning lights can be seen. This under the lowest visibility conditions. When translated into distance, this means from 900 to 2,000 feet before you can expect to see fixed steady burning lights and at the most critical time of the entire approach, namely the transition from instrument to visual.

Far from being a frill, the pilots consider the condenser discharge lights as essential and are demanding that they be made a mandatory component in the National Standard for approach lighting.

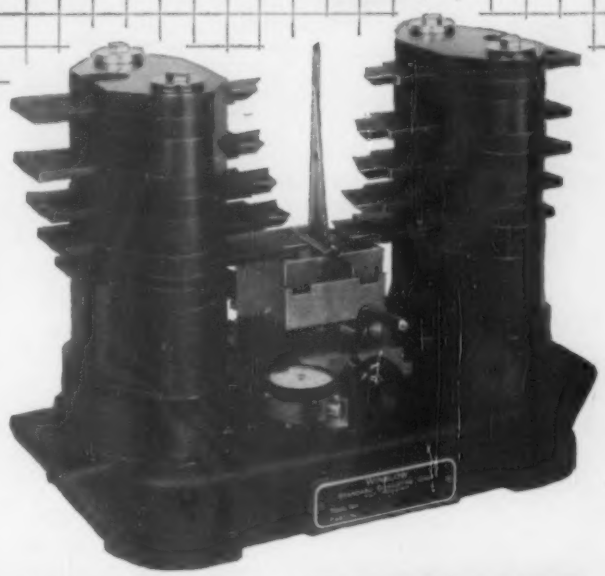
▶ **Low Minimums**—Mr. Pearson would have one believe that centerline bar lighting as contained in the National Standard for approach lighting is only good down to approximately present operating minimums of 200 foot ceiling and ½ mile visibility, whereas unbiased tests and much experience with scheduled air carrier operations have shown this system to be completely adequate for approaches under conditions of visibility wherein pilot was unable, after crossing runway threshold, to land properly, or to hold his alignment on the runway after touchdown, due to deficiencies in present day runway lighting.

Again, Mr. Pearson has missed the boat. The pilots' real problem at this time, when operating with the National Standard centerline cross bar system, **with condenser discharge lighting**, is not with approach lighting but with runway lighting. It also appears that recent developments with flush-type runway lighting give strong promise of correcting present runway lighting deficiencies.

J. F. GILL,
Pilot, Eastern Airlines
25 Rowan Road,
Chatham, N. J.

(John Gill, EAL's Chief Pilot, New York Area, is well known for his work on approach lighting. In addition to being Air Transport Assn.'s representative at the

here it is! the perfect answer to precision airfoil inspection of jet engine blades!



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• assembled from stock components

• interchangeable parts

• quick delivery

• checks all 10 features

• maintains original accuracy

• lower original cost

• less down-time

• quickly re-worked for parts changes

Already in use by the leaders of the jet engine industry, this new kind of guillotine gage solves the problem of maintaining accuracy. Templates are supported over a much larger area of their surface, making wear negligible. And alignment is guaranteed by heavy stacked towers that are bolted together for ruggedness and complete rigidity. Winslow's new design and assembly from precision-built interchangeable parts give six big advantages. You get quick delivery and lower original cost. You save on maintenance—in case of damage substitution of some parts can be made without even removing the gage from your inspection line.

Gage down-time is cut, requiring fewer gages and avoiding costly production holdups. And finally, you reduce your gage investment with a truly multi-purpose instrument—check all 10 features of a jet engine blade with a single gage; check forging and finished part with only one gage. No more gage obsolescence—Winslow's Re-Work Service quickly up-dates the gage when your part changes. Easy to use and easy to read, the Winslow speeds production, gives "more accuracy for less money."

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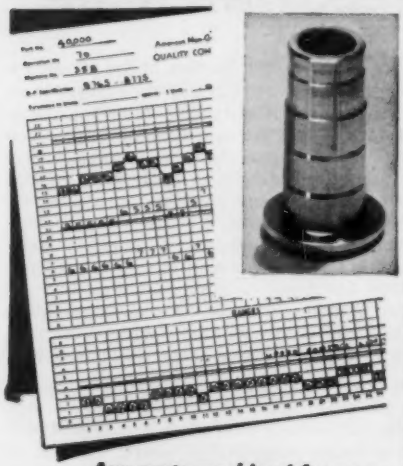

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★ Expense-free Los Angeles interviews will be arranged for qualified applicants.

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Arcata approach lighting tests, he is responsible for introduction of the sequence flashing condenser discharge lights now used as an aid to landing in restricted visibility at airports throughout the world. In 1951, he was selected by Flight Safety Foundation to receive one of the annual AVIATION WEEK *safety awards for his work in this field. Capt. Gill has been with Eastern since 1930, and before that had logged 5,000 hr. of flight time in the Army Air Corps.—ED.)*

Whose N3N?

Apparently you have lost your subscribers at NAF in Philadelphia, otherwise they would have raised a hue and cry over your caption under the picture on page 62 of the June 6 issue that started with—'The Last of the Yellow Perils' and went on to say that the N3N is the Navy-built version of the Boeing-Wichita (formerly Stearman) N2S trainers.

Actually the N3N was designed and built at NAF, originally with a Wright J5 engine and later with a Wright J6-7 engine, it had just general resemblance to the Boeing N2S.

The structure was 100% aluminum alloy and covered with fabric except the vertical fin and the fuselage side panels; the upper wing was one piece, straight thru, without a center section; it had ailerons on all four outer panels instead of just on the lower as the Boeing; the landing gear was not cantilever as was the Boeing.

So you see the most that can be said for simularity is—they were both biplanes.

We look forward to your magazine every week and thought the record should be set straight for the boys who worked so hard on this project at NAF.

GEORGE TOWNSON, Pres.
George Townson, Inc.
Buehl Field,
Eddington, Pa.

Help Offered

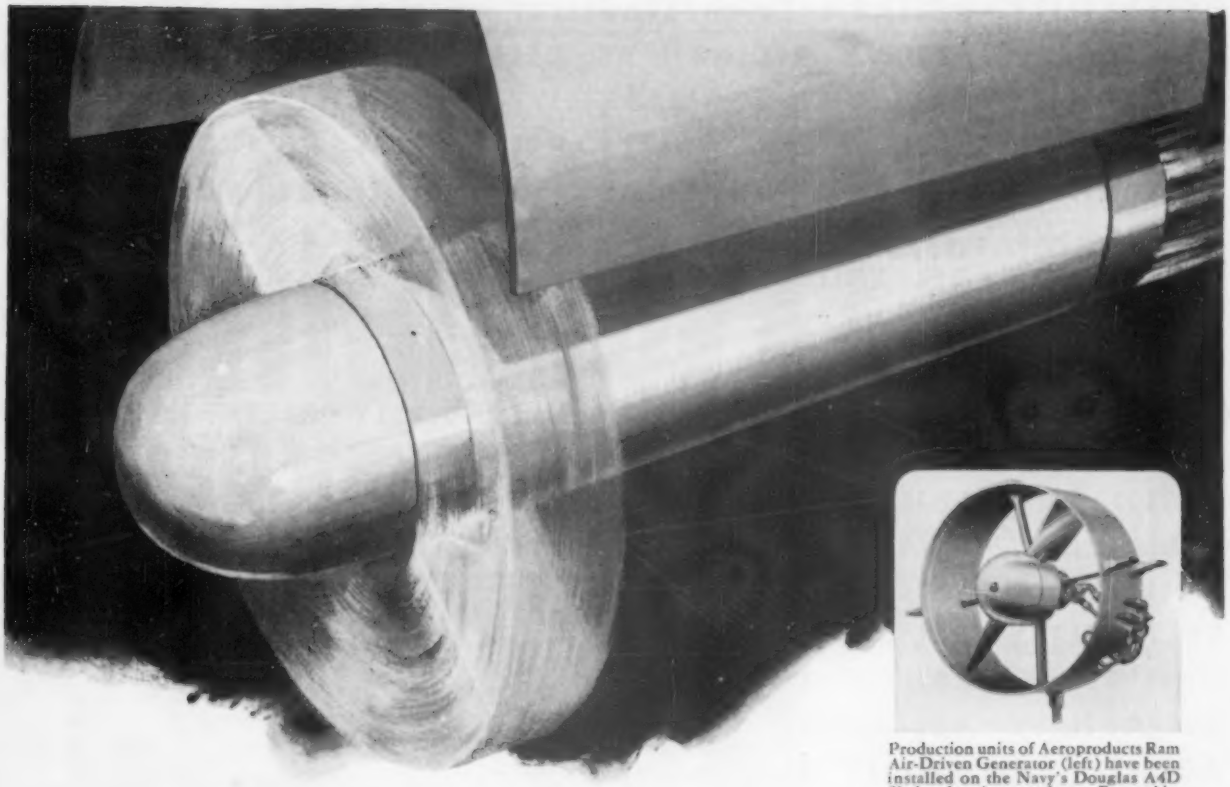
Aircraft instruments have really made progress, says AVIATION WEEK, June 13, 1955, page 96, in its review of altimeters from 1929 to 1955. A prominent advertiser in the same issue uses four full pages, in two colors and "slipvision" yet, to tell of its finest instruments.

Phooey! There has not been any improvement in the legibility of numerals and letters on instruments and nameplates since 1929, and the illustration accompanying your article and "slipvision" prove it.

It's about time all engineering departments throw out their mechanical ink lettering sets and remove the instrument face jobs from the ink tracing groups. Then, seek the services of any reputable typographer, commercial artist, industrial designer or myself; any one of whom has a current 1955 graphic arts knowledge of layout, typesetting and reproduction techniques.

Of course the professionals might charge slightly more for their services than the existing wage scale of the humble ink tracers, but flight crews would get more legible instruments.

JOHN T. HALES
Advertising and Art Service
624 Eighth Place
Hermosa Beach, Calif.



Production units of Aeroproducts Ram Air-Driven Generator (left) have been installed on the Navy's Douglas A4D Skyhawk; Aeroproducts Ram Air-Driven Hydraulic Pump (above) is scheduled for installation on jet fighters.

Emergency Power in Seconds--

Electric or Hydraulic!

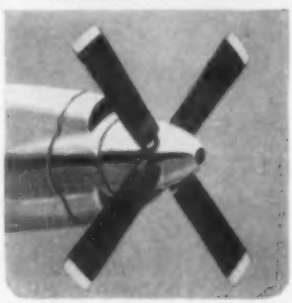
AEROPRODUCTS AIR-DRIVEN GENERATORS AND AIR-DRIVEN HYDRAULIC PUMPS GIVE POWER INSTANTLY TO FLY AND LAND A PLANE SAFELY

Aeroproducts has the answer to your requirements for emergency sources of electric and hydraulic power—ram air-driven emergency generators and hydraulic pumps.

In less than two seconds, Aeroproducts ram air-driven generators develop sufficient power to operate flight control surfaces and cockpit instruments necessary to fly and land a plane safely. Also, within this time, Aeroproducts ram air-driven pumps produce sufficient hydraulic pressure for the flight controls.

Aeroproducts also is ready *now* to meet your most demanding specifications for turbopropellers, propellers requiring high horsepower absorption, actuators, and other aircraft components now under development. Call or write us for details.

Actuators for Afterburners



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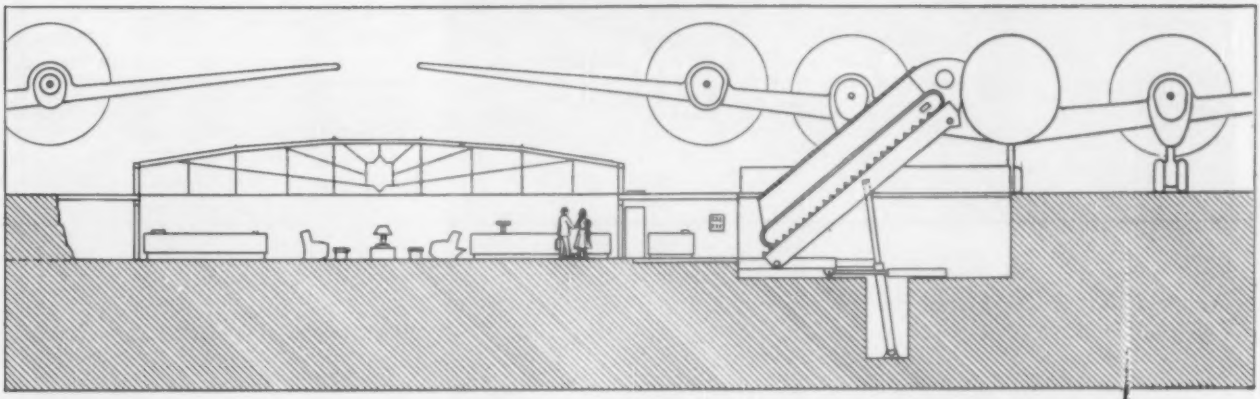


INTERNATIONAL AIRLINES air terminal with retractable variable-pitch escalators would provide four or six-position wings.

Loading Plans to Ease Passengers' Lot

Three approaches to the problem of enplaning passengers without exposing them to rain, snow and propwash blasts have been proposed by Control Instrument Co.

Control Instrument engineers made a company sponsored study of the business of terminal passenger handling. Result is an illustrated brief outlining recommendations for the best means of getting airline passengers aboard their planes comfortable and dry, regardless of weather conditions.

The three solutions proposed by Control Instrument Co., a wholly-owned subsidiary of Burroughs Corp., are broken down into three classes, according to airport and airline size—small, medium or large. The proposals:

• **Loading bus.** Minor airports, or small airlines serving any size airport, should use a bus to haul passengers from terminal to aircraft, according to the company. Passengers would leave terminal through a fully enclosed loading platform, boarding bus through the rear. At the front of the bus, variable-pitch, covered stairs leading to a height-adjustable, enclosed platform, would allow passengers to enter plane without exposure to the weather after bus had been driven to the plane and the platform positioned at the entrance door.

At small airports, this system has the advantage of not requiring large unloading areas to accommodate planes during peak movement periods or having planes wait in line if number of gates is insufficient. Aircraft could off- and on-load passengers anywhere on the ramp, with the bus shuttling to and from the terminal building.

At large airports, using the bus to transport passengers would allow the smaller carriers to use the less expensive but more remote ramp areas for passenger loading and unloading. Also, smaller aircraft could be kept away from the congested main ramp area.

Control Instrument engineers have worked out several details of the bus operation, including remotely operated pneumatic or hydraulic-controlled doors at each end of the bus to allow one-man operation of the vehicle. Spring bumpers on either end of the bus would automatically lock brakes as vehicle made contact with plane or platform.

The bus operation would not be expensive, the company believes, because distances to be covered are relatively short—transit time is a matter of minutes. One bus could serve several planes quickly, so that a small number of vehicles would be needed.

Also because distances are short, buses need not travel very fast, therefore could use low-power engines. Much of the bus and loading platforms could be made out of standard, off-the-shelf parts.

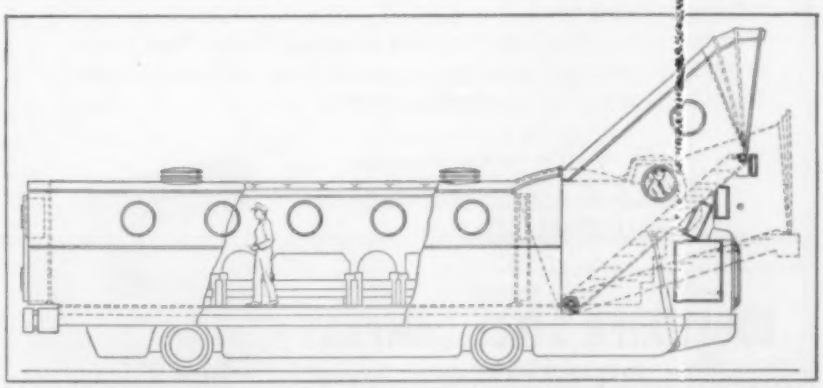
• **Passenger concourse.** For secondary airports, Control Instrument proposes partially subterranean concourses 7-9 ft. below field level so the roof would clear aircraft wings. Passengers would board planes via adjustable belt-type loading ramps.

While the airplane was being positioned on the apron, doors strong enough to support the heaviest aircraft would cover the loading ramp which would be retracted in a trough under the apron. When plane was ready, doors would be opened and ramp raised to plane entrance door height. It could be moved longitudinally towards the plane with a maximum travel of about 10 ft.

Passengers and friends would wait in the concourse immediately adjacent to the plane. To emplane, passengers would walk on to the covered moving conveyor and be taken aboard.

Ramp positioning and conveyor controls would be located at both ends of the ramp. Maximum ramp grade would be 20%.

• **Concourse and lounge.** Large metropolitan and international airports would use a very similar loading system. Principal differences are that airlines would provide lounges in the concourse adjacent to their respective gates. Covered, variable-pitch escalators would



LOCAL-SERVICE AIRPORTS could use 60-passenger bus with ramp that rises to 12 ft. 6 in.

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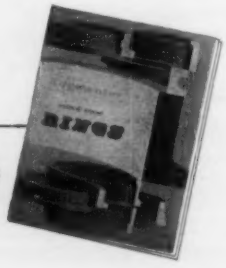
• save machining time

• save costly material

Edgewater weldless rings, rolled from solid steel blocks, are made in diameters from 5 inches to 180 inches, and weights up to 14,000 pounds. The cross-section drawings above show some of the shapes produced by the Edgewater rolling process. Simple or complex sections are accurately formed, minimizing machining operations, and reducing material costs.

Among the applications for which Edgewater Rolled Steel Rings are recommended are: turret gears, shroud rings, compressor rings, spacer rings, parts for reciprocating engines.

WRITE for free booklet describing how Edgewater Rolled Steel Rings are made and showing some of the rolled-sections produced by this process.



EDGEWATER STEEL COMPANY

PITTSBURGH 30, PA.

move passengers to the plane with maximum comfort.

Escalators would extend from troughs under the apron and be positioned against the plane in the same manner as the conveyor belt ramps.

Control Instrument spokesmen feel that these three means of allowing airline passengers to board their planes will be a big step in making air transportation a first class operation from the minute the passenger puts himself in the care of an airline to until he arrives at destination.

American Opens New West Coast Hangar

A new, million-dollar maintenance hangar has been put into service at San Francisco's International Airport by American Airlines.

The hangar can house two DC-7s at a time. Its doors have circular cutouts to allow the tails of AA's various planes—DC-7s, DC-6s, DC-6Bs and Convairs—to protrude through adjustable doors.

The facility incorporates a "levelator," a push-button-controlled section of steel floor that can be raised to truck-bed height to simplify off-loading heavy and bulky items such as engines, then return to floor level.

With an eye to very heavy aircraft of the future, American made the parking ramp adjacent to the hangar out of 3-ft.-thick concrete.

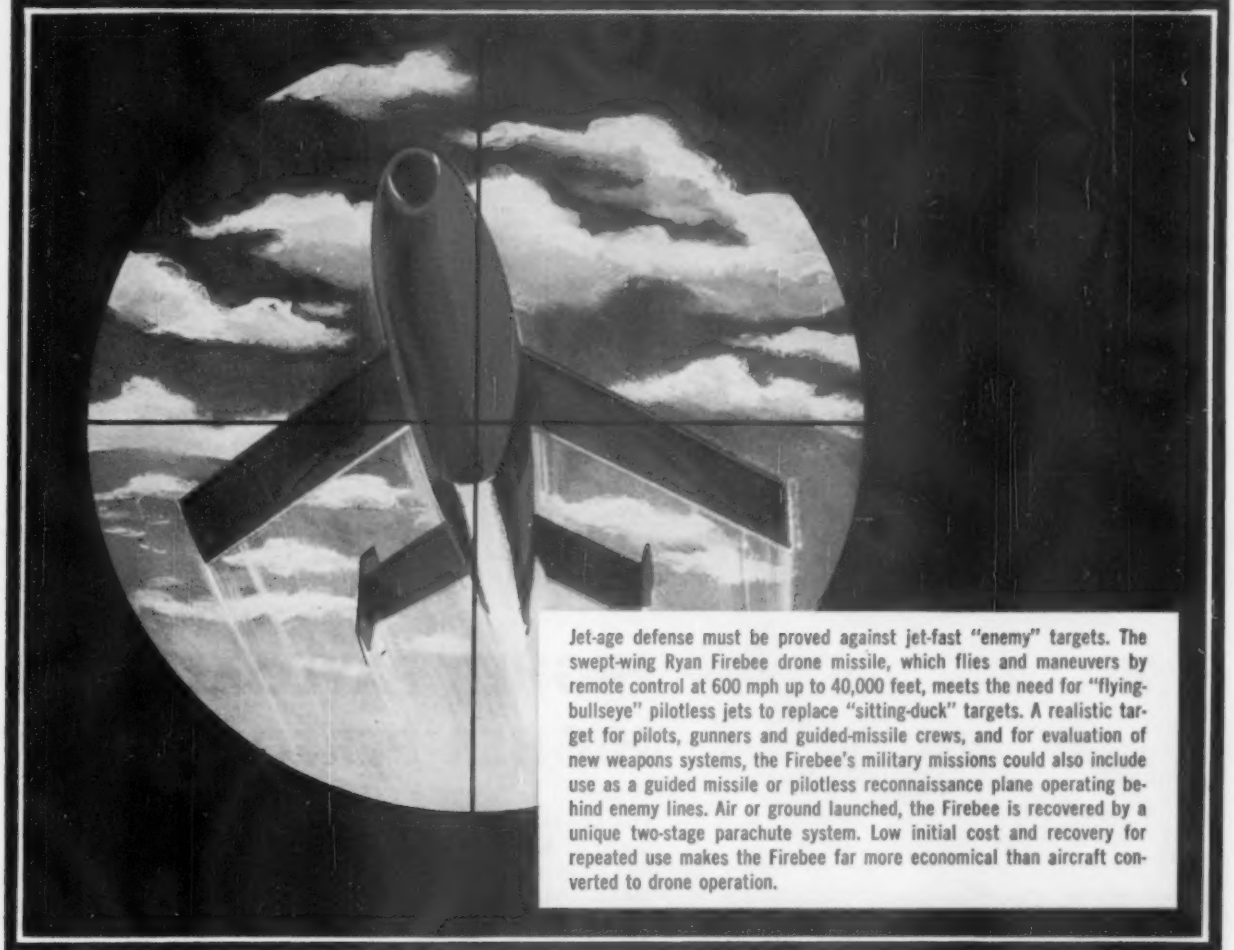
Provisions have been made to expand the building both laterally and vertically, the office wing having been stressed to take a second floor.

AA has also leased an additional six acres at the airport in preparation for future expansion.

Start & Tow Units

These aircraft starting and towing units were recently completed for the Royal Iraqi Air Force by Red Devon, Ltd., Totnes, England. Ford V8 engines supply both propulsive and electrical power. Units are powerful enough to tow large aircraft, with low slung design permitting passage under wings and fuselage. Overseas sales agents: Aerocontracts (Ground Equipment), Ltd., Gatwick Airport, Horley, Surrey, England.

FIREBEE–600 MPH "BULLSEYE"



Jet-age defense must be proved against jet-fast "enemy" targets. The swept-wing Ryan Firebee drone missile, which flies and maneuvers by remote control at 600 mph up to 40,000 feet, meets the need for "flying-bullseye" pilotless jets to replace "sitting-duck" targets. A realistic target for pilots, gunners and guided-missile crews, and for evaluation of new weapons systems, the Firebee's military missions could also include use as a guided missile or pilotless reconnaissance plane operating behind enemy lines. Air or ground launched, the Firebee is recovered by a unique two-stage parachute system. Low initial cost and recovery for repeated use makes the Firebee far more economical than aircraft converted to drone operation.

Another Example of How

RYAN BUILDS BETTER

America's fastest, most elusive target—the Firebee—is an outstanding achievement in advanced design. To meet the needs of America's air defense, Ryan engineers created this new pilotless aircraft by skillfully blending their knowledge of aerodynamics, jet propulsion and electronics. For more than 32 years, industrial and military leaders have called upon Ryan to solve the increasingly complex problems of aeronautical science. Striking examples are the Firebee, Ryan's new jet VTO airplane, precision built components for jet, rocket and piston engines, and electronic devices for guidance and navigation.

Engineers looking for a challenging future will find outstanding opportunities at Ryan.

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HIGHER PAYLOADS *and* HIGHER PERFORMANCE

This compact, light-weight rocket powerplant, designated by the U.S. Air Force as the LR63-AJ-1 liquid-propellant rocket, has been successfully flight-tested on the Republic F-84F airplane. Used for assisted-takeoff, this powerplant and its big brother, the YLR45-AJ-1, which was extensively flight-tested on Boeing's B-47B Stratojet during 1954, have proved the practical application of rocket power to piloted aircraft.

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MORE POWER FOR AIR POWER

Aramco Expanding Private Airlift

By Erwin J. Bulban

Arabian American Oil Co. is expanding its already large—$8 million—private airline, to provide the additional transportation required to keep pace with its oil-producing competitors in the Middle East.

Aramco's aviation department provides vital air support for the company's 440,000-sq. mi. petroleum empire in Saudi Arabia, some 7,000 mi. from New York.

• **August 1956, Aramco takes delivery** on a specially built Douglas DC-6B/A that will replace the combination passenger-cargo DC-4E the company now operates with two DC-6Bs on bi-weekly scheduled trans-Atlantic service from New York to Dhahran, Saudi Arabia.

• **Aramco** is transferring its turnaround and airframe maintenance of its trans-Atlantic fleet from Lockheed Aircraft Service-International to its own new 23,000-sq. ft. facility at N. Y. International Airport.

• **It is adding** a third de Havilland-Canada Beaver Mk. 3—the trio replacing three Navions and providing increased lift capacity in Aramco's Middle East field operations.

When current deliveries and disposals are completed, Aramco's business aircraft fleet will comprise two DC-6Bs, one DC-6B/A, two Convair 340s, seven DC-3s, two Beech C18Ss and the three Beavers.

EMPLOYES DEBARK at Dhahran, Saudi Arabia, after 27-hr. flight from N. Y. in DC-6B.

SUPPLIES ARE UNLOADED from Aramco DC-3 at a company pump station in desert.

Began With One

This is a giant stride from 1934 when the company operated a single Fairchild 71 in the desert on liaison, mapping and supply missions. Today's two-pronged international operation with its 17-plane fleet works out of headquarters in New York and Dhahran. The former is staffed by 75 aviation personnel, including six seven-member trans-Atlantic crews; the latter employs over 180 people, including approximately 15 pilots.

Top man in Aramco's Aviation Department is George Kraigher, who spends about four months a year in the Middle East checking operations there.

This year Kraigher is working with an estimated $6-million aviation budget which he figures will be split about 50-50 between trans-Atlantic and Middle East services.

Key factor in this big corporation aircraft effort is the 35 billion barrels of oil estimated to lie under Saudi Arabian sands, a prize so rich that Aramco thus far has invested over $500 million there and pays the Kingdom revenues amounting to 50% of the oil producer's net operating income.

The know-how required to get this vast operation underway was supplied by thousands of imported American technicians who were not only concerned with finding oil, getting it out of the ground, transporting it, refining it and selling it; but also personnel who had to engineer and supervise building living quarters, hospitals, stores, docks, rail facilities, radio networks, electric powerplants, motor pools and overhaul facilities for thousands of vehicles and scores of other jobs.

Today more than 3,000 American specialists work with about 14,000 Saudi Arabians and 5,000 others of about a dozen nationalities. Counting dependents, there are approximately 6,500 Americans in Saudi Arabia.

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place fast is a two-fold mission that Kraigher splits between his operations superintendents in New York and Dhahran.

Trans-Atlantic Business

The American working force in Saudi Arabia is recruited under a four-year contract that supplies them and their dependents with transportation to and from the States, with pay and allowances starting on date of employment.

Tour gives personnel and their dependents 50 days vacation at the completion of the first two years, more at the end of subsequent tours. This facet of the contract is strictly enforced by Aramco medical personnel.

The necessity for clockwork phasing in-and-out of thousands of vacationing employes, in addition to transporting new employes, executives and high-priority materiel without the delicate system bogging down in a paperwork nightmare, is why Aramco decided early after World War II to set up an independent international air service.

The company found that traffic was sufficient to economically justify a private trans-Atlantic operation and the stakes were too high and the operation too complex to be keyed to commercial airline operations.

Last year about 8,000 Aramco personnel arrived and departed at New York via its International Division. The airline carried a total of 23,000 personnel en route, including those that dropped off at one of the European stops instead of returning to the States for vacations, or for business, and then were picked up on return trips to Dhahran. Load factor averaged 80%, Kraigher told AVIATION WEEK. The International Division accounted for some 38.7 million passenger-miles in 1954, in addition to 470 tons of freight, mostly eastbound, totaling 2.9 million cargo ton-miles.

27-Hour Flight

On a summer schedule, a DC-6B leaves N. Y. International Airport on Wednesday at 1900 hr. GMT, arrives in Gander for a fuel stop at 2315, leaves Gander at 0045 and lands at Amsterdam at 1015. After an overnight stop, the plane takes off at 1130, arrives in Rome at 1515, leaves Rome at 1645 and arrives in Beirut at 2315. At Beirut, new employes are offloaded to go to nearby Sidon for two-to-five weeks indoctrination.

At 2345 the DC-6B continues to its terminus, Dhahran, arriving at 0400, total of about 27 flying hours. The plane leaves Dhahran Sunday and arrives in New York Tuesday. The other DC-6B leaves New York on Friday, arrives in Dhahran Monday, leaves Dhahran Tuesday and returns to New York on Thursday. The DC-4E leaves New York the following Wednesday, arrives at Dhahran on Saturday, leaves Sunday and is back in New York on Tuesday.

Trans World Airlines supplies weather and communications services to Gander and across the Atlantic; KLM Royal Dutch Airlines provides these services from Amsterdam, and TWA picks them up again from Rome. Should the airplanes require maintenance or an engine while in Europe, KLM and TWA provide necessary service. In more than 1,000 international trips since 1947, Aramco has never injured a passenger or crew member and averaged less than one engine change en route per year, Kraigher noted.

Approximately 30% of Aramco's people travel via commercial airlines, including executives or specialists whose schedules are too tight to wait for an Aramco plane.

Then there are special cargo problems that require chartering commercial aircraft. Last year Aramco figured out a way to break down two huge portable pumping units for air shipment—a venture made economical since the pumps would increase oil production by 25,000 barrels a day. Two KLM DC-6As and three DC-4s hauled the 83,000-lb. load across in less than a week and it was operating a week later.

When Aramco gets its new DC-6B/A

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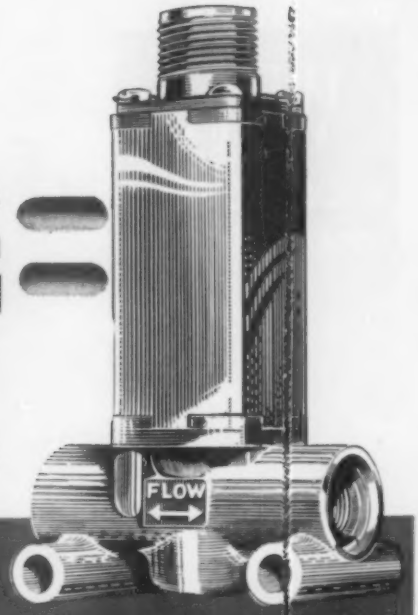

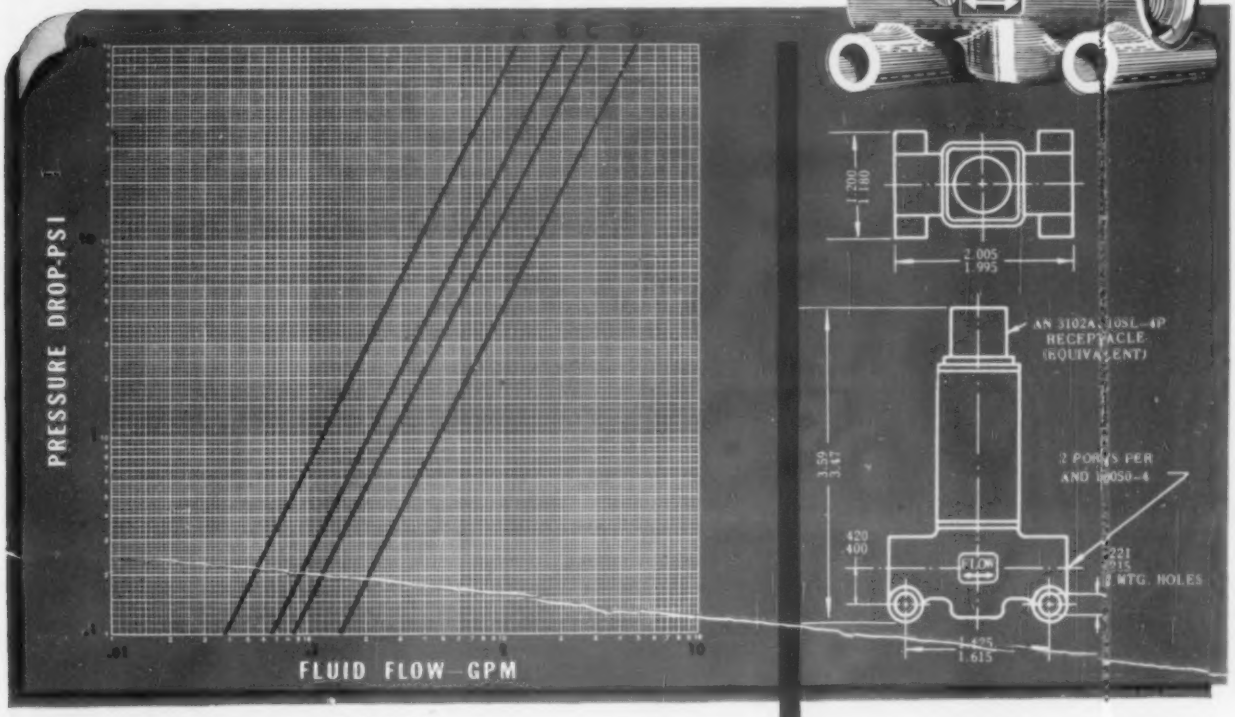

TABLE

Valcor Valve Part No.	Type	Max. Operating Pressure	Flow Characteristics
V-3800	Normally Open	200 psig	See Curve D
V-3900	Normally Closed	100 psig	See Curve D
V-6800	Normally Open	300 psig	See Curve C
V-8400	Normally Closed	200 psig	See Curve C
V-8500	Normally Open	300 psig	See Curve B
V-5000	Normally Closed	300 psig	See Curve B
V-8300	Normally Open	500 psig	See Curve A
V-7000	Normally Closed	500 psig	See Curve A

SPECIFICATIONS:

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- **AMBIENT TEMPERATURE**—minus 65° to plus 180°F.
- **MAX. LEAKAGE**—½ cc/hr. fuel
  10 cc/min. air
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At Menasco all departments—research, development and production—work as a team to meet the challenge of stronger, lighter, more efficient and compact aircraft landing gear. That is why Menasco has consistently led the design trend. Typical of Menasco engineering achievements is this nose gear for the Convair F-102. Menasco's proposal provided Convair a saving of 15% in critical landing gear weight. This interesting design, now in service, combines the most effective application of both steel and aluminum. Menasco's advanced engineering approach to the weight question can also be applied to your landing gear problems.
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next year, the company will gain important cargo capacity because of the plane's configuration. From fuselage station 340 forward, the transport will be a DC-6A with a big loading door on the port side to take 9,000 lb. of bulky items. From the cargo compartment aft, the airplane will be a DC-6B with 26 seats in a forward passenger compartment plus two rear compartments having eight seats making up into four bunks, plus two divans. In addition to providing needed bulk cargo capacity, the new plane will ease fleet maintenance and operations problems after the DC-4 is sold.

The current DC6Bs have 34 seats forward and 14 seats in the rear compartments. The DC-4E seats 36. Each plane has three bunks for crew members. The crews consist of captain, first officer, flight engineer, navigator, radio operator and two cabin attendants.

Desert Operations

At Aramco's Dhahran base, an operations superintendent works his 14 multi- and single-engine aircraft into

GEORGE KRAIGHER, manager of Aramco's aviation department and overseer of a $6-million air budget, is also the expert who makes the recommendations on new equipment. Starting his aviation career as an officer pilot in the Serbian and Yugoslav air forces in World War I, Kraigher has some 15,000 flying hours. He became a U. S. citizen in 1927 and has flown for Pan American World Airways in Mexico, Central and South America, Africa and the Middle East. Commissioned a lieutenant colonel in the USAAF in 1942, he commanded the 12th Transport group on West Africa's Gold Coast. Subsequent assignments included operations in the North African Sector, ATC, 15th Air Force and the Air Crew Rescue Unit, Mediterranean Allied Air Forces. He has twice been decorated with the Legion of Merit, received a Silver Star and five Air Medals. Kraigher joined Aramco in 1948.

Electronic equipment back in action at "tube-reheating" speed

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It's now possible to get electronic equipment back into service just as quickly as warm tubes reheat to *safe operating temperature* . . . instead of waiting the full time required to heat cold tubes. Quick-action Radair timing relay starts operation *minutes sooner* when tubes have not completely cooled from previous operation.

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a variety of scheduled and nonsked services that cover flights between stops from 35 mi. apart to about 1,100 mi. nonstop. Missions include occasional air-rescue flights when a vehicle is overdue in the desert or a workman is injured or has become ill at one of the isolated work sites.

The Saudi Arabian fleet puts in about 850 flying hours a month with some 60% of the operations being scheduled. Last year it airlifted between 1,500-2,000 tons of cargo 600,000 ton-miles and flew 27,500 passengers nearly 12.5 million passenger-miles with an average load factor close to 75%.

The plush 40-seat Convairs make once-weekly long-haul flights from headquarters to Beirut, about 1,000 mi., and Asmara, Eritrea, approximately 1,100 mi. and otherwise criss-cross the Middle East on top-priority business flights. They each average some 80 hr. a month.

DC-3 workhorses hit the pump stations, about 125 mi. apart on the 1,000-mi.-long pipeline from Dhahran to Beirut, thrice weekly, supply test and exploration parties in the desert and make regular rounds of the oil station network. Beech 18s assemble personnel for communications meetings and check pipelines from the air. Beavers go out as needed to exploration parties.

Aside from occasional small-area mosaic aerial photography, using DC-3s fitted with cameras, Aramco relies upon outside specialists for major aerial oil exploration work. The flight and evaluation equipment and experience required for these missions is something that the company feels would take too long to acquire to be feasible.

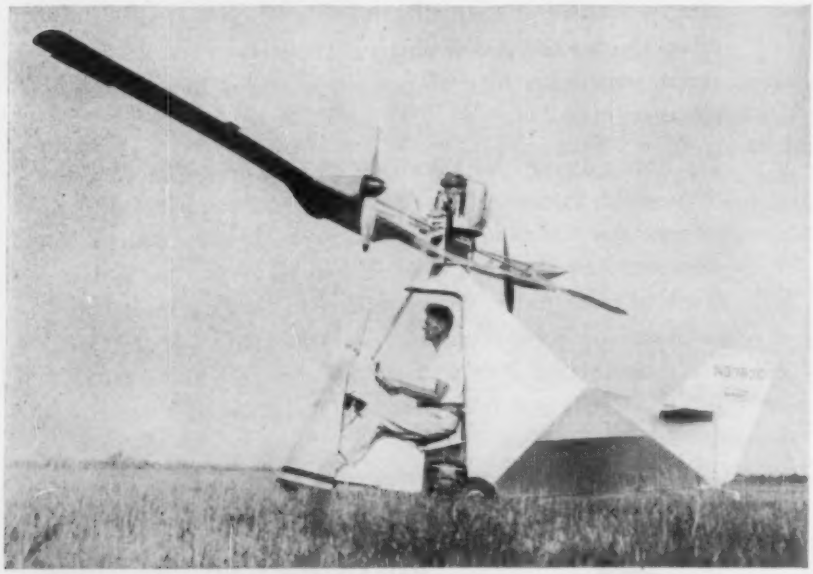
Although flying conditions in the field for servicing the roving exploration parties would be considered rough-and-ready by Stateside pilots, who would also miss their fairly solid communications networks, Aramco pilots have maintained a remarkably clean record with no fatalities. Year-round weather is satisfactory for flying, although the summer Shamals, dust storms that kick up to nearly 15,000 ft., are a major hazard. When a pilot sees one of these, he turns around or sits down.

Navigation is mostly by dead reckoning using a driftmeter and homing in on the camp's 200-400-kc. ADF transmitters. The exploration parties lay out a standard one-kilometer strip in the prevailing wind, which is generally north-northwest. An old tire or oil waste is ignited to provide wind direction. Generally the terrain is capable of taking a DC-3 flying 26,900 lb. of cargo, Kraigher told AVIATION WEEK.

Saudi Arabia maintenance headquarters at Dhahran includes two 140 x 160-ft. hangars and a spares inventory worth approximately $600,000. For major overhauls, engines, instruments and accessories are shipped back to the U. S. by boat, and the work farmed out to specialists. Pratt & Whitney gets the R2800s, Airwork the R1830s and R985s.

Roundtrip time for engines runs about six months from the Middle East to the U. S., although if the spares inventory runs short, engines sometimes go by air.

Desert flying does not impose any particular strains on aircraft and their equipment, AVIATION WEEK was told, but to be on the safe side, Aramco gives its aviation equipment some 10% less time between overhauls than the manuals require.



BENSEN SKY-SCOOTER, priced at $6,800 is designed to cruise about 120 mi. at 60 mph. using a mixture of automobile premium gas and oil. Fuel tank is detachable so that the gas and oil can be mixed by shaking. Weighing 360 lb. empty, the craft can carry 380-lb. load, states its designer and builder, Igor Bensen, Raleigh-Durham Airport, N. C. A 45-hp. aircooled engine is mounted above the hub of the single 39-ft. rotor and drives the two small propellers midway on the rotor. Handlebar motorcycle controls suspended from the cabin roof utilize left handlegrip to work rotor lift and engine speed; forward speed is controlled by pulling and pushing the handlebars. Rudder pedals provide steering. Bensen also plans to offer the Sky-Scooter in kit form, priced at $980. He does not reveal whether the craft has been flown. Bensen also builds a towed-copter kit.

PRIVATE LINES

A large U. S. rubber corporation was the first to sign up for National Airlines' executive transport plan, under which NAL provides specially fitted Lockheed Lodestars with crews on a charter basis to business firms, AVIATION WEEK has learned. National supplies the planes at a single quoted price including all flight costs, fuel, oil and insurance up to a $7-million maximum. Subscribers can purchase the aircraft later, with lease cost applied to the purchase price. NAL has converted two of its 11 Lodestars to executive configuration and plans to complete the others by the end of this year.

Beech-Morane-Saulnier 760 jet four-place business plane, flew the French Ambassador to the U. S. from Washington to New York in approximately 35 min., averaging about 360 mph. at 14,000 ft.

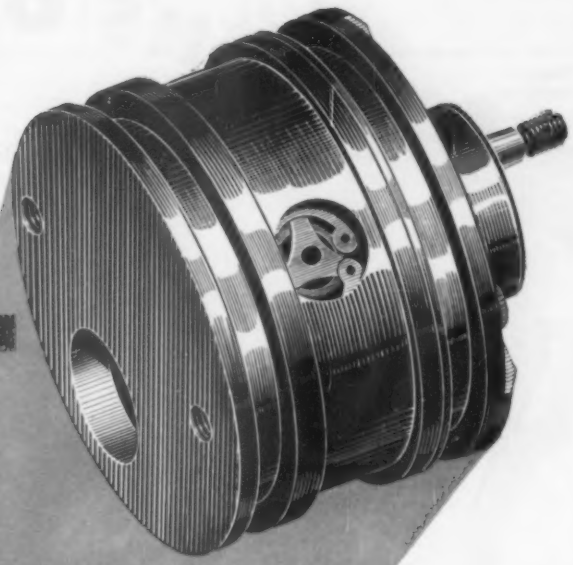
Bell 47G copter has been purchased by United Manufacturing Co., Chicago, to flight-test the firm's line of uranium and mineral detection equipment as a result of increasing use of copters in mineral surveys. . . . Another Model 47G has been sold to Hawk Helicopters, Corpus Christi, Tex., for contract aerial surveys over 175,000 acres in South Texas to hunt uranium. Former Hawk 47G used in this operation, fitted with $6,000 worth of instrumentation, returns to offshore oil work.

All Stinson engineering data, service spare parts, tools and jigs and name and trademark have been sold by Piper Aircraft Corp., Lock Haven, Pa., to Vest Aircraft Co., Parts Division, Sky Ranch Airport, Denver, Colo. Sale covers Stinson Models 108 series and military L-5. Stinson operators can order spares through Piper dealers, the former owner reports.

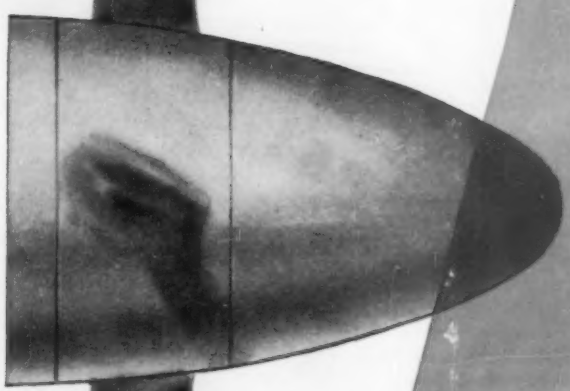
New air defense identification Zones (ADIZ) planned by USAF Air Defense Command will completely encircle the U. S., plugging present gaps.

cartridge pumps...

here's another reason why original equipment manufacturers should see Pesco before making their own pumps



Actual size illustration of Model 011815 Pesco Cartridge Pump showing inlet and outlet ports. Pump delivers over 2 gpm at 5050 RPM and 1050 psi. Low weight is a feature of the unique Cartridge Pumps—this unit weighs only one pound.



Pesco Cartridge Pumps are the standard for pitch control and governing applications in hydraulically controlled aircraft propellers. Today, all such propellers having independent oil systems use Pesco Cartridge Pumps.

Look what's happened to hydraulic pumps! Packed into the tiny envelope illustrated above is a miniaturized hydraulic pump of advanced design—the Pesco Cartridge Pump.

This Pesco innovation answers the need for extremely compact pumps for incorporation into packaged hydraulic or lubrication systems. They are Pesco-designed to be integral components of such assemblies, relieving manufacturers of the problems of designing, producing or servicing their own pumps. By giving Pesco this responsibility, manufacturers deal with pump specialists having extensive experience. The result—packaged systems that operate better and more dependably are produced with fewer headaches.

Cartridge Pumps have all the outstanding features you would expect to find in a Pesco pump including "Pressure Loaded" bearings for longer service life and higher volumetric efficiency. In addition, they require no shaft seals or external plumbing connections and may be mounted in the oil sump. These gear-type pumps operate at pressures to 4,000 psi and speeds to 12,000 RPM.

Can we work with you in designing a Cartridge Pump for your packaged system? Your project will receive the personal attention of skilled engineers to assure a successful solution. For details, write: PESCO, 24700 North Miles Road, Bedford, Ohio.

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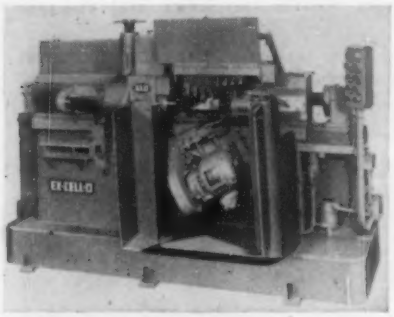


Profilers For Big Blades

Two new profiling machines have been developed for milling and grinding airfoils of forged turbojet compressor blades that measure up to 18 in. long by 6 in. wide.

• **Style 186 for milling** can be used with titanium as well as stainless steel. Work feeds lengthwise across the milling cutter and indexes radially after each cutting stroke. Position of the blade relative to the cutter is maintained by a steel cam on the work head which engages a follower on the machine base.

• **Style 187 grinder** uses the same type of cam to control height of the blade in relation to the grinding wheel. But instead of the blade feeding lengthwise, it rotates and feeds across the grinding wheel.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

General-Purpose Oscilloscope

General-purpose oscilloscope for static or dynamic testing of aircraft and industrial equipment records up to 71 individual variables on one oscillogram when combined with suitable transducers and amplifiers, the maker reports.

Wide selection of galvanometers, usable to 6,000 cps., provides measuring flexibility during turbojet or aircraft structure tests.

Features of new PM-20 oscillograph include: two separate galvanometer mounts allowing simultaneous use of wound-coil and bifilar types; drive system which does not require change gears to obtain speeds from 4 to 500 fpm.; and an automatic shutter that closes as the 100-ft. record holder is released from the equipment, reducing possibility of fogging during transport.

General Electric Co., Instrument Department, Lynn, Mass.

Oscilloscope Has 40 Channels

Large-screen display oscilloscope features 40 input channels and is said to have approximately 2% sweep linearity with a system linearity of 1%. Vertical line graph is 9 in. high x 12 in. wide on a 17-in. cylindrical face tube. Each vertical line terminates in a dot for easy and accurate reading. Output of each of

the 40 amplifiers is scanned four times a second.

Frequency response of each channel is within 2% from 10 cps. to 10 kc. and down to no more than 3 db at 50 kc. Each channel is high-impedance, single-ended with one side grounded. Maximum sensitivity of each channel is stated to be 45 mv. peak for a full 9-in. vertical deflection.

Electromec, Inc., Oscilloscope Department, 5121 San Fernando Rd., Los Angeles 39, Calif.

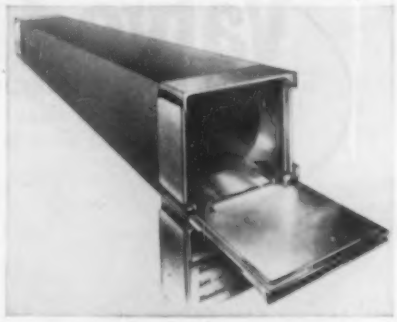
Electromagnet Brakes A.C. Motor

A self-energized d.c. electromagnetic brake is said to decelerate rotating fractional-horsepower a.c. motors from 11,300 rpm. to rest in less than one-fifth second.

Fan-cooled and fully enclosed, the aircraft-type motor is available in continuous duty ratings from 1/30 to 1/4-hp. and speeds of 5,600, 7,500 or 11,300 rpm. Ratings apply from sea level to 75,000 ft., the maker says.

Motor weighs 3.5 lb., overall length is 5 3/4-in., width is 3 5/8-in. Unit is designed to MIL-M-7969A and is suitable for power input according to Type I of spec MIL-E-7894.

Small Motor Division, Westinghouse Electric Corp., Lima, Ohio.



Drawing File Is Self Indexing

Crushproof, fire-resistant self-indexing files that dovetail to form any desired shape and size blocks are made to store tracings and blueprints of any specified lengths.

Spring-loaded doors are slotted for indexing, color coding and out-marking.

Pack Manufacturing Co., P. O. Box 508, Logan, Utah.

Broacher Uses Endless Chain

Surface broaching machine features "one-way" nearly continuous metal removal by mounting a series of broach carriers on an endless chain. Carriers enter precision ways before contacting the work for greater accuracy. After entering the carriers, the broaches become individual rams.

Model VCA-10-150 stands 11 1/2 ft. tall and has an effective broach length of 12 ft. 10 in. Infinite variation of cutting speeds covers 10 to 50 surface feet/minute.

Colonial Broach & Machine Co., P.O. Box 37, Harper Stat., Detroit 13, Mich.

Reader Evaluates Theodolite Film

Precision reader used for semi-automatic evaluation of tracking film taken during missile or aircraft flights has a large screen for projecting individual frames and has computers and storage systems for exact measurement of tracking angles and errors.

Data are automatically recorded on

(Advertisement)

Valve Talk

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by Marvin Miles,
Senior Member, Aviation Writers Assn.

When you think of Republic Aviation you probably think in terms of Thunderjet . . . Thunderstreak . . . Thunderflash . . .

Perhaps your thought jumps ahead to the F-105, still classified.

Or does it go back to the "Jug"?

Remember the Thunderbolt, the P-47 of World War II fame?

A news story in January, 1942, disclosed the rugged fighter, "hitherto secret, heavily armed, world's fastest single-engine airplane."

Less than a year later it was credited with diving faster than sound — the first time I became aware of that dramatic barrier — with speeds of 725 m.p.h. and then 840 m.p.h. attributed to young Army pilots.

In all, Republic built a record 15,329 Thunderbolts, but all this was years after a small note appeared in a newspaper financial section of October 13, 1939: "Stockholders of the Seversky Aircraft Corp. at a special meeting today voted to change the name of the corporation to Republic Aircraft Corp."

Originating in 1931 as the Seversky corporation with one building, 30 employees and a grass landing field, Republic was organized in Farmingdale, N.Y., out of the company that was famed for the old Lancer fighter, predecessor of the Jug — or "T-Bolt" as some pilots called it.

Today the corporation has more than 40 buildings, including four manufacturing plants on Long Island, and 21,000 employees working on 560 acres.

The Thunderbolt, of course, was the company's first great achievement and although the Jug didn't dive faster than sound — but rather into its drag-rise fringe — it was one of the outstanding fighters of World War II with a remarkable combat record.

Next in line of Republic's famed successes came the F-84 Thunderjet series, the sleek and versatile jets that proved themselves so valuable in the Korea struggle.

Said Lt. Gen. Glenn O. Barcus, when he commanded the Fifth Air Force in Korea and talked of interdiction — the destruction of huge quantities of enemy vehicles, installations and equipment:

"Our prime weapon in this program is the jet fighter-bomber, and the workhorse of this hammering force is the Republic F-84 Thunderjet. It has speed, capacity, range and the deadly virtue of surprise. It is a rugged, well-built plane that can take it when the flak gets thick. Pilots swear by the plane and the enemy hates it.

"On missions of close support, to aid our front line troops by attacking specific gun positions, tanks or bunkers, the fighter-bombers again carry the ball. The Thunderjet pilot gets his greatest personal satisfaction from this work..."

Republic built 4457 Thunderjets and set many a record with the tough little fighters: First jet fighter to attain "atomic capability," first operational jet launched and retrieved from a B-36, first manned fighter hurled aloft by a zero-length launcher, holder of two Mackay trophies, the Harmon Trophy, the Bendix Trophy, two Allison trophies, first place trophy in a world-wide USAF gunnery meet...

Currently in volume production are the F-84F Thunderstreak, atomic-bomb-carrying jet fighter-bomber which holds the new official transcontinental speed record at 652 m.p.h. (Los Angeles to New York in 3 hours, 44 minutes) and the RF-84F Thunderflash, very high speed photo recon plane.

Both go to the U.S. and Allied air forces where the Thunderstreak joins its predecessor, the Thunderjet, as NATO's standard fighter-bomber.

All these ships, remember, can be refueled quickly in flight with equipment first developed in the fighter field by Republic. This helped Thundercraft set a series of distance records — 25 planes covering 4485 miles fromGeorgia to England and French Morocco and more recently four fighter-bombers 4840 miles (latest non-stop record) from Japan to Australia.

Then, disclosed last year, were the F-103, an upcoming, radically advanced experimental interceptor; the F-105, an advanced fighter-bomber scheduled to follow the Thunderstreak; the XF-84H, an experimental turboprop fighter and the YF-84J, a super-Thunderstreak fighter-bomber.

A superb record that should make every American proud.

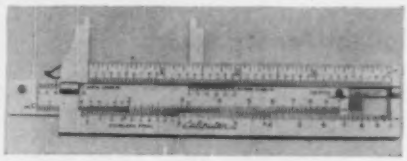
Whittaker salutes Republic.

electric type writer and either punch cards or paper tape for digital computer processing. Unit can be used on Contraves EOTS theodolite and Askania Cinetheodolite records.

Oerlikon Tool & Arms Corporation of America, P.O. Box 3049, Asheville, N. C.

ALSO ON THE MARKET

Caliputer is pocket-size combination vernier caliper, depth gage and slide rule made of 302 stainless steel. Caliper and



depth gage readings are accurate to 0.001-in., the manufacturer states.—Jet Air Engineering Corp., 367 Sixth Ave., San Diego 1, Calif.

Power floor sweepers operate at speeds to 15 mph., use dust hopper instead of removable bag to simplify unloading. Units have a range of sweeping paths from 36 to 68 in., with two side booms. Coverage is said to be over 100,000 sq. ft./hr.—Wayne Manufacturing Co., Pomona, Calif.

HydraFork tiering truck of 2,000 or 3,000-lb. capacity is "walkie" type that can work in 67-in. aisles.—Lewis-Shepard Products, Inc., Dept. R-21, Watertown, Mass.

Heat and solvent resistant decals include HR for temperature range to 400F; SHR, 500-600F; HHR, up to 1,000F, intermittent.—Meyercord Co., 5323 W. Lake St., Chicago 44, Ill.

Combination self-flaring fittings in standard sizes from ¼ to 2 in. have hard-metal wedge insert that permanently secures in the connector body of the fitting.—Flodar Corp., 1366 E. 45th St., Cleveland 3, Ohio.

Kelon-T (Teflon) tape in widths to 24 in. is available in thicknesses from 0.005 to 0.125 in. Item has uniform dielectric constant and power factor is said to be held over a wide frequency range from −300 to 300F, the maker states. —W. S. Shamban & Co., 11617 W. Jefferson Blvd., Culver City, Calif.

Constant preload equipment for Sonntag simulated service fatigue machines of 400-lb. load capacity corrects automatically for creep. With maximum preload of 200 lb., maximum movement of vertically reciprocating load platen is 0.625 ± 0.312. Maximum movement with preload is 1 ± 0.5 in.—Baldwin-Lima-Hamilton Corp, Philadelphia 42.

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...ON JET RINGS

By switching to flash butt-welding of extruded sections, we helped one customer cut fabricating costs of a jet engine ring from $67.85 to $41.93. A saving of $25.92 per ring — roughly 40%.

This is one of many cases in our files where rolling and flash butt-welding of bars, sections, extrusions or plate has proven to be the most economical and practical method of fabricating circular components. Shown below are some other "American Welded" components.

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420 DIETZ ROAD • WARREN, OHIO

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Weldment of carbon steel bar and plate for use on heavy earth-moving equipment.

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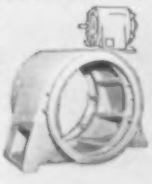
Welded band for hermetically sealed refrigerator compressor.

SPECIAL MILL ROLLED SECTIONS
Amweld can show you how to save critical material and valuable machinery time by use of these sections.



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FIELDS OF ENGINEERING ACTIVITY	TYPE OF DEGREE AND YEARS OF EXPERIENCE PREFERRED											
	Electrical Engineers			Mechanical Engineers			Physical Science			Chemistry Ceramics Glass Technology Metallurgy		
	1-2	2-3	4+	1-2	2-3	4+	1-2	2-3	4+	1-2	2-3	4+
SYSTEMS *(Integration of theory, equipments, and environment to create and optimize major electronic concepts.)*												
AIRBORNE FIRE CONTROL			W						W			
DIGITAL DATA HANDLING DEVICES			C			C			C			
MISSILE AND RADAR			M			M			M			
INERTIAL NAVIGATION			M			M			M			
COMMUNICATIONS			C O						C O			
DESIGN • DEVELOPMENT												
COLOR TV TUBES—Electron Optics—Instrumental Analysis—Solid States (Phosphors, High Temperature Phenomena, Photo Sensitive Materials and Glass to Metal Sealing)	L	L	L	L	L	L	L	L	L	L	L	L
RECEIVING TUBES—Circuitry—Life Test and Rating—Tube Testing—Thermionic Emission	H	H	H		H	H		H	H		H	H
SEMI-CONDUCTORS—Transistors—Semi-Conductor Devices	H	H	H				H	H	H			
MICROWAVE TUBES—Tube Development and Manufacture (Traveling Wave—Backward Wave)		H	H		H	H		H	H		H	H
GAS, POWER AND PHOTO TUBES—Photo Sensitive Devices—Glass to Metal Sealing	L	L	L	L	L	L	L	L	L	L	L	L
AVIATION ELECTRONICS—Radar—Computers—Servo Mechanisms—Shock and Vibration—Circuitry—Remote Control—Heat Transfer—Sub-Miniaturization—Automatic Flight—Design for Automation—Transistorization	X	F X	M C F X	X	F X	M C F X	X	F X	M C F X			
RADAR—Circuitry—Antenna Design—Servo Systems—Gear Trains—Intricate Mechanisms—Fire Control	X	F X	M C F X	X	F X	M C F X	X	F X	M C F X			
COMPUTERS—Systems—Advanced Development—Circuitry—Assembly Design—Mechanisms—Programming	C	C F	M C F	C	C F	M C F	C	C F	M C F			
COMMUNICATIONS—Microwave—Aviation—Specialized Military Systems		F	M C F		F	M C F		F	M C F			
RADIO SYSTEMS—HF-VHF—Microwave—Propagation Analysis—Telephone, Telegraph Terminal Equipment		O	O F		O	O F		O	O F			
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COMPONENTS—Transformers—Coils—TV Deflection Yokes (Color or Monochrome)—Resistors		C	C		C	C		C	C			
MACHINE DESIGN Mech. and Elec.—Automatic or Semi-Automatic Machines		H	H		H	H		H	H			

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P-7011, Aviation Week
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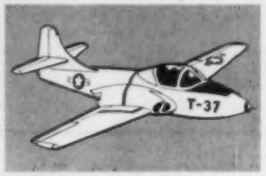
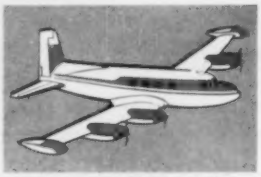


Jet Trainer



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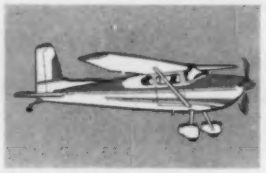

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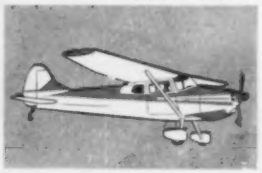

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The Personnel Manager

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P-7008, Aviation Week
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330 W. 42 St.
New York 36, N. Y.

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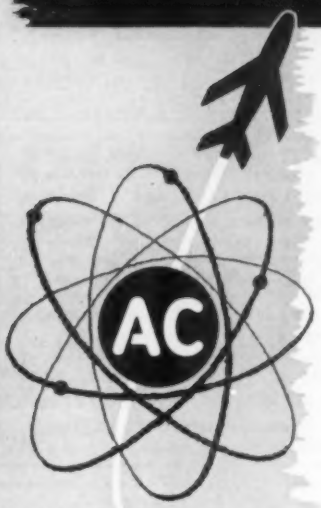

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BOX 516, ST. LOUIS 3, MISSOURI

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RW-7047, Aviation Week
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DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads.

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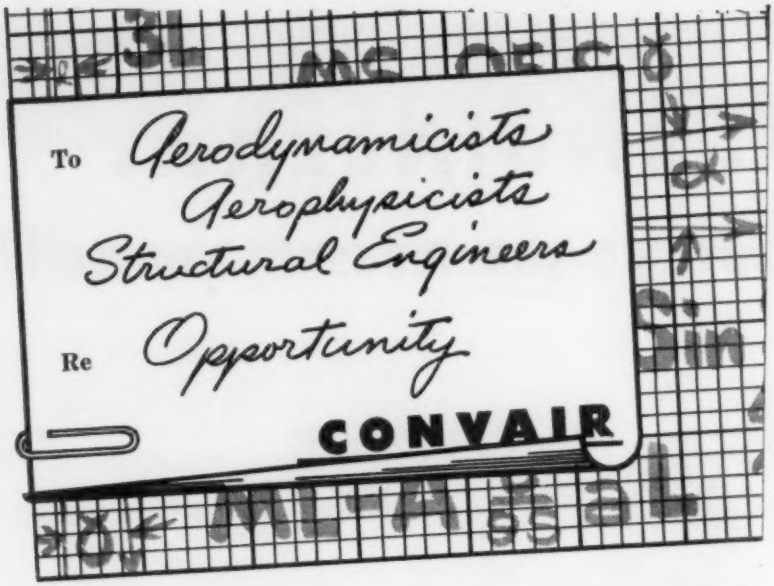

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(Continued from page 9)

Dr. W. J. Strang, chief designer, fixed wing aircraft, Bristol Aeroplane Co., Ltd., Filton House, Bristol, England. Other Bristol chief designer appointments: **R. Hafner**, helicopters; and **D. J. Farrar**, guided weapons.

Dr. Angelo Miele, associate professor, School of Aeronautical Engineering, Purdue University, Lafayette, Ind.

Peter J. Schenk, marketing manager, General Electric Co.'s light military electronic equipment department, Utica, N. Y. He was formerly executive officer to the Technical Assistant to the Secretary of USAF.

V. B. Baker, assistant engineering manager, executive department, E. Pittsburgh Divisions, Westinghouse Electric Corp., Pa.

Ralph J. Eschborn, chief engineer, Jack & Heintz, Inc., Cleveland, Ohio.

Capt. M. W. Ashby, United Air Lines flight manager, New York; **Capt. J. W. Belding**, flight manager, San Francisco and **Capt. H. G. Portman**, flight manager, Los Angeles. **George D. Boon**, UAL station service manager, LaGuardia Airport, N. Y.

Harry J. Higgins, sales manager, Portland Copper & Tank Works, Inc., S. Portland, Me., jet engine subcontractor.

Glenn C. Earl, midwest district sales manager, Leach Corp., Los Angeles, Calif.

Byron W. Brown, sales manager, Hoffman Electronics Corp., Los Angeles, Calif.

Robert T. Morrison, manager, new West Coast plant of Fansteel Metallurgical Corp., S. Pasadena, Calif.

T. M. Reilly, director of budgets and research, Scandinavian Airlines System.

Ward D. Davis, military contracts and commercial sales departments, Doman Helicopters, Inc., Danbury, Conn.

David H. Robinson, manager commercial aviation sales, Radio Corporation of America, Camden, N. J., succeeding **R. S. Mangel**, on temporary overseas sales assignment for RCA's International Division.

Howard J. Findley, assistant engineering director, Eaton Manufacturing Co., Cleveland, Ohio.

George C. Stewart, Jr., sales director for new Sales Division, Dalmo Victor Co., electronic firm, San Carlos, Calif.

Richard Wheatland, traffic manager, New York Airways.

Lt. Col. Leonard J. Hutton, USAF plant representative, Convair, Ft. Worth, Tex.

K. Robert Hahn, division contracts manager, Grand Rapids, Mich., Division, Lear, Inc.

David H. Oldham, field engineer, Revere Corporation of America, Wallingford, Conn.

John A. Wilson, manager, contracts and Legal Division, Hiller Helicopters, Palo Alto, Calif.

Robert H. Wilkie, merchandising manager, Sales Department, New Departure Division, General Motors Corp., Bristol, Conn.

Merrill A. Young, works manager of Marquette Metal Products Co., Cleveland. Other changes: **John L. Fuller**, engineering director in charge of product engineering and quality control; **Jerry Gleitz**, manufacturing engineer.

L. R. Ulrich, superintendent of meteorology for the Pacific-Alaska Division of Pan American World Airways. He succeeds **C. A. Stiefelmaier**, assigned to the PAA technical assistance program in Pakistan.

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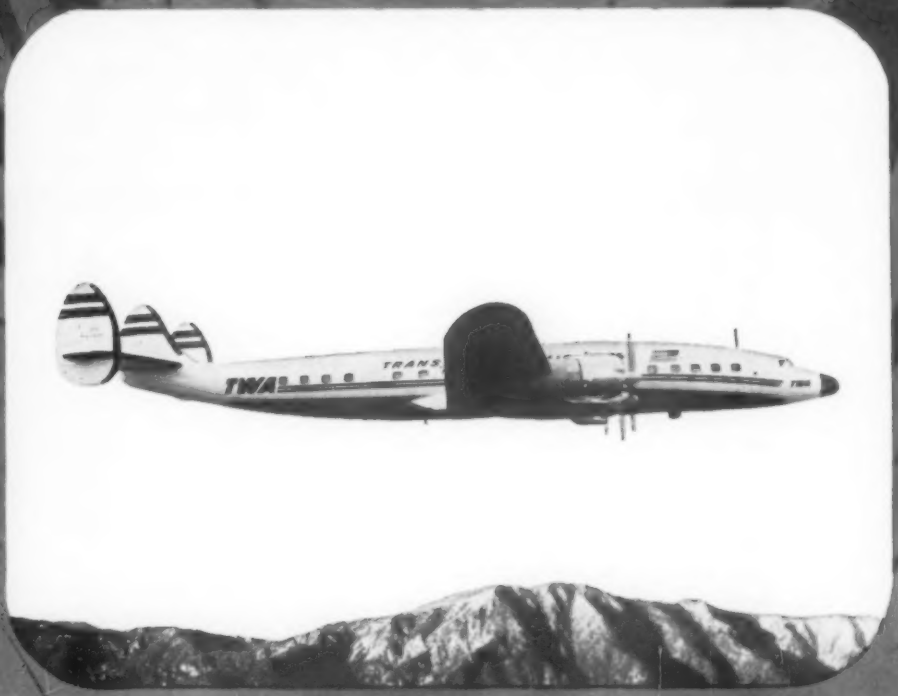

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☐ **Check contents** and locations of first-aid kits. Be sure they're adequate and up to date. Here again, your CD Director can help—with advice on supplies needed for injuries due to blast, radiation, etc.

☐ **Encourage personnel** to attend Red Cross First Aid Training Courses.

☐ **Encourage your staff** and your community to have their homes prepared. Run ads in your plant paper, in local newspapers, over TV and radio, on bulletin boards. Your CD Director can show you ads that you can sponsor locally. Set the standard of preparedness in your plant city. There's no better way of building prestige and good employee relations—and no greater way of helping America.

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Capital Stakes Its Future on Viscounts

British turboprop transport will equalize position in hard competition with Big Four, Carmichael says.

By Preble Staver

Washington, D. C.—Equalizer in the stiff competition Capital Airlines faces from the Big Four carriers will be the Vickers Viscount turboprop transport, J. H. "Slim" Carmichael, Capital president, told AVIATION WEEK.

Carmichael said that 80% of Capital's business is in competition with American Airlines, Eastern Air Lines, Trans World Airlines and United Airlines, all recently re-equipped.

"Their DC-7s and Super Constellations have been hitting us pretty hard. By throwing their best at us it is fairly indicative that they recognize Capital's competition which we take as a compliment," Carmichael said.

"We can and will cut schedules to flying times unsurpassed by any other equipment presently in commercial use. Passenger comfort features of the Viscount will make the final difference." The Viscount starts service with Capital July 26.

Jump on Turbines

Capital expects to exploit profitably the advantage of being the first U. S. airline to place turbine-powered commercial aircraft in service. Purchase of the British-built transport is expected to give Capital a three to four year jump in lead time before U. S. manufacturers can start delivery of turboprop commercial aircraft. Capital insisted that Vickers guarantee delivery of 40 Viscounts before any other U. S. orders could be filled.

Ranking sixth among the trunklines, Capital has staked its future on the Viscount. "And it is a future of unlimited horizons," Carmichael said. "Capital is going to be the best airline in the world; we're not worried about being the biggest. The corporate future as well as my own rests squarely on the Viscount. We are either awfully wrong or awfully right, and I think we were right, in buying 60 Viscounts."

The Viscount gives the airline two main advantages, according to Carmichael:

- **Capital is now up with the leader as far as equipment is concerned.** "We have an airplane that matches anything in our area," he said.
- **Capital will gain 90% standardization with the Viscount.**

Passenger appeal of the Viscount has been demonstrated in European operations and Carmichael feels the impact on the U. S. traveling market will be as successful. "The Viscount is a new, exciting airplane that has lots of sex appeal," he said, "and public acceptance of the Viscount already has exceeded our fondest hopes."

Plan of Action

Carmichael says his aim is to consolidate Capital's position in the industry. The two-pronged plan of action:

- **Strengthen route structure.**
- **Meet competition on an equal basis.**

Carmichael indicated that Capital may turn to Civil Aeronautics Board for help.

"We now must solve the last problem facing Capital: a weak route structure," he said. Specifically, Capital is seeking access to long haul markets. "We have an acute need to strengthen our present marginal short haul operations and I am confident that CAB will grant our applications for new routes." At the present time 77% of Capital's revenues are derived from 13 cities in its 76-city route system.

"Fortunately, the Board's philosophy has undergone a change from the previous position that protected the long haul transcontinental carriers by restricting the regional, limited carrier," Carmichael said. "Capital should win new route awards solely on merit as the Board becomes convinced that the short haul operator needs the protection of local restrictions and not the cross country trunklines."

Capital is involved in three major route cases (see box, p. 113).

Cost Awareness

"We want competitive equality more than anything else," Carmichael said. "We won't have it until the Board's previously imposed restrictions are lifted and route extensions awarded. We have lived up to our responsibilities under the statute and I believe the Board will recognize this."

Carmichael tempers his optimism with an awareness that there are many obstacles to be overcome. He said that 1955 has been a tough year so far.

Although revenues have steadily increased the rise in costs has kept Capital below the industry's average rate of growth. There is an acute awareness of costs. Capital's 4,600 employes are familiar with Carmichael's statement: "We've got $67 million worth of new equipment to be paid for."

Capital has turned against air coach service in seeking new revenues, although the carrier was a pioneer operator of coach services. Carmichael hinted that Capital will resist further coach expansion. He said today's air coach service is nothing more than reduced-fare transportation which diverts standard fare services. "The original principle of utilizing available equipment and crews during off-peak hours has been lost," he said. "The ultimate solution will have to be a reduction in first class fares."

Route problems, fare battles and equipment difficulties are not new to Capital management. Eight years ago when the Carmichael administration began, Capital was a "sick" company. Under Carmichael's leadership, Capital is off subsidy, making money and paying dividends. First dividend was not paid until 1954 and that was in the form of stock.

Says Carmichael: "Capital doesn't ask for any preferential treatment and the Viscount doesn't need any."

Capital Gets Nonstop Norfolk-Atlanta Route

Capital Airlines will operate new nonstop service between Norfolk and Atlanta.

Civil Aeronautics Board decided that a nonstop service between the two southern cities is required and has picked capital to perform the service over three other applicants—Eastern Air Lines, Delta-C&S Air Lines and National Airlines.

The two cities are currently served by Capital, but route restrictions make service slow and circuitous. The Board has found that the traffic potential, estimated between 18,000 and 25,000 passengers a year, is sufficient to support nonstop service, and that the service can be rendered profitably.

Choice of 8 Flights

Capital Airlines was chosen over the other three applicants for the service because it currently serves both points and carries a major portion of traffic between them. Authorization of Eastern, National or Delta would have

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Capital Route Cases

Here are the three major route cases in which Capital Airlines is a participant:

- **New York-Chicago Case. Civil Aeronautics Board examiner W. F. Cusick has recommended removal of restrictions to permit Capital's operating nonstop services between New York-Chicago, New York-Detroit and New York-Pittsburgh, thereby allowing Capital to compete equally between the three pairs of cities. Capital also was recommended for a route between Detroit and New York via Buffalo, Rochester and Syracuse.**
- **Northeast-Southwest Case. Capital seeks route extension to Houston, Dallas and Fort Worth. The removal of present route restrictions is also sought and Capital has further asked to close the gap now existing on its system for Washington-New York nonstop service.**
- **New York-Florida Case. At hearings now underway, Carmichael pushed Capital's case for entry in the Miami market as one of 14 major applicants. He declared Capital offers anything any other applicant can offer plus the only tie-in with the Great Lakes area to Florida.**

called for certification of a new route.

The Board also found that selection of Capital promises to have relatively the least overall adverse effect on the other carriers involved.

In its decision, CAB accepts the findings of its examiner favoring Capital for the service. Delta and Eastern objected to these findings on the grounds that they could offer Norfolk service to points beyond Atlanta.

The Board says that such service improvements become relatively less important in view of the ease of connection at Atlanta with its high volume of traffic.

The examiner found that Capital's nonstop passengers would have a choice of eight different flights at Atlanta within 90 minutes, offering direct service to 24 cities southwest of that point.

Less Adverse Effect

Eastern Air Lines is currently a major participant in Atlanta-Norfolk traffic, although the carrier doesn't serve Norfolk directly. CAB finds that Eastern's loss in the market through selection of Capital would exceed Capital's loss if Eastern were chosen, but that Eastern will gain interline business at Atlanta from Capital passengers traveling beyond that point.

The net effect of the choice of Capital on Eastern, as well as on National and Delta, is found to be less than the adverse effect on Capital if one of the others were chosen.

Varig Goal: Half U.S.-Rio Traffic

New York—Varig Airlines will try to take at least 50% of the U. S.-Brazilian traffic from American air carriers when it starts scheduled service next month between New York and Rio de Janeiro. If successful, the Brazilian flag line plans to expand its flights further—moving next onto the highly competitive trans-Atlantic routes.

"New York-Rio has been strictly an American operation, and some 50% of the traffic is Brazilian," Varig President Rubem M. Berta told AVIATION WEEK. "So we're just trying to take what has belonged to us for a long time. But our operation also will increase volume on the route. The appeal of a new airline will draw new passengers.

"When we digest the New York operation, we'll start thinking about expansion to Europe. We've got to keep expanding. If we stop, we'll be in trouble. To expand, we've got to get new routes."

Varig's first trans-Atlantic service probably will be to Great Britain and France, two European countries that now have bilateral air agreements with Brazil.

The Brazilian airline will start regular service on its New York route Aug. 5 with three Lockheed 1049G Super Constellations delivered during the past 60 days. Special inaugural flights will take off from Rio de Janeiro July 29 and from New York Aug. 2.

The route will go via Ciudad Trujillo, offering direct service between the U. S. and the Dominican Republic, and extend south from Rio to Sao Paulo, Montevideo and Buenos Aires.

Frequency will be limited to one roundtrip a week during the first months, but is expected to increase to three a week by early 1956.

Varig's 1049Gs will seat 47 first-class passengers and 15 tourist-class. Service aboard the Super Connies will be slanted toward South Americans.

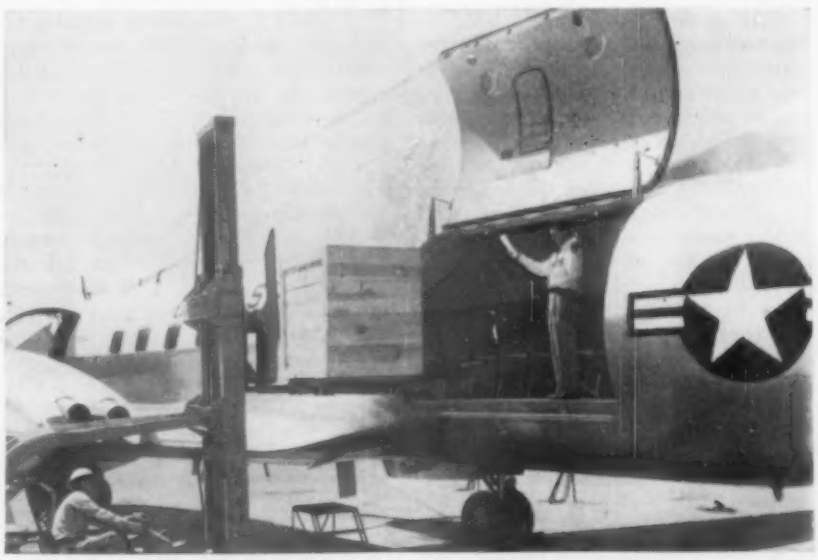
"U. S. flag airlines have a service that's hard to beat," said Berta. "We know that, so the only thing we can do is render a service to a certain type of people—Brazilians.

"In addition to service on the planes, we'll offer guide and other personal aids to passengers while they're in New York. Lots of Brazilians don't come to the U. S., because they can't speak English and can't find their way around."

On board the Super Connie transports, Varig will offer these special services:

- **Polylingual crews.** Stewards and stewardesses will speak English, Portuguese, German, Spanish and French.
- **Freshly-prepared meals.** The line will have its own kitchens at each stop and has brought cooks from Europe to man them. There will be no frozen meals on the New York-Rio route.
- **Free drinks.** Beverages will include cocktails, liqueurs, champagnes, wines and—of course—Brazilian coffee.

If traffic volume increases as expected



First Navy R4Y-1 Loads for Tests

Air cargo is loaded aboard Navy's first Convair R4Y-1 for production flight tests prior to delivery. A multi-purpose transport patterned after the 340, the R4Y-1 can carry 12,000 lb. of airfreight, 44 passengers, in removable seats or 27 litter patients. The plane's cabin floor, reinforced plastic-covered extruded aluminum, can support a load of 300 lb. per square foot. Navy has ordered 36 R4Y-1s.

on the New York route and if trans-Atlantic flights are started, Varig will need new long range transports. Berta indicated the next order will be for several more 1049Gs or possibly Douglas DC-7Cs.

"In time, we're going over to turboprops," he said, "but the airplane we're looking for is not available. The only long range turboprop is Bristol's Britannia, and it's still in the development stage.

"We'll buy a turboprop within the next five or six years, but right now we'll stick to the 1049G or buy DC-7Cs."

Trans-Pacific Wins Five-Year Renewal

Civil Aeronautics Board has decided to maintain competition in Hawaiian air transportation by renewing the certificate of Trans-Pacific Airlines for five years.

The Board said that the cornerstone of its decision, which has been approved by President Eisenhower, is the imperative need for competitive air service in the Hawaiian Islands.

In its order, CAB:

- **Renewed Trans-Pacific's** certificate until Dec. 31, 1959.
- **Amended Hawaiian Airlines'** certificate to authorize service to Kamuela, Hawaii, and between points on the Island of Maui.
- **Exempted Cockett Airlines and Andrew Flying Service** from economic regulations to permit air taxi operations in Hawaii.

CAB agreed with earlier findings of its examiner that "nowhere within the jurisdiction of the Board is there an area where certification of only one air carrier would place all transportation facilities so exclusively under the control of one organization."

The Board points out that since the Inter-Island Steam Navigation Co., HAL's parent company, terminated passenger service among the Islands in 1948, the only regular transportation has been by air. Termination of Trans-Pacific's operation, says the CAB, would put HAL in a complete monopoly position.

CAB concludes that there is sufficient traffic volume in the Islands to support competitive service. Total traffic in January 1955 increased 8.29% over January, 1954, and February traffic was up 5.71% over February, 1954.

In reference to HAL's contention that certification of TPA has resulted in increasing subsidies, the Board disagrees and says that the record indicates that the increased subsidy burden was the product principally of the uneconomic practices of HAL's management.

Rothschild Favors $42 Million Annual Airport Aid for 2 Years

Washington, D. C.—An annual $42 million federal airport aid program for the next two years was proposed to Congress by Commerce Under Secretary for Transportation Louis Rothschild. The action means that the Administration has yielded to overwhelming pressure from Congress for an accelerated airport program.

This is a compromise with legislation authorizing $63 million a year for the next four years, which Rothschild previously flatly opposed in testimony before the Senate Commerce Aviation Subcommittee (AW June 13, p. 131). Despite the Administration opposition, the measure, sponsored by Sen. Mike Monroney (D.-Okla.) chairman of the Senate Commerce Aviation Subcommittee, and Rep. Oren Harris (D.-Ark.), chairman of the House Commerce Transportation Subcommittee, was unanimously passed by the Senate. (AW July 4, p. 83).

Under the "contract authority" approach, Civil Aeronautics Administration would be able to enter contracts providing federal aid for airport projects and Congress would be obligated to appropriate funds subsequently covering the obligations. Under the 1946 Airport Act, CAA has had to obtain appropriations first.

Reason for Change

Under the Monroney-Harris measure, there would be $83 million available for airport aid in Fiscal 1956: the $63 million contract authority—$60 million for continental and $3 million for territorial projects, plus a $20 million direct appropriation that has already been approved. Rothschild proposed that the $20 million be considered a part of the $42 million program he proposed. Although only half the amount contemplated in the Monroney-Harris bill, the $42 million almost four times the $11 million the Administration proposed for Fiscal 1956 in January.

Rothschild explained the Administration's change on the contract authority approach: "as a general principle, contract authority . . . is undesirable, because it removes the program from annual budgetary review by the President and the Congress.

"At the same time, we . . . recognized the desirability of greater stability for the airport grant-in-aid program . . . consideration has been given to possible alternative arrangements, within the framework of annual appropriations, which would achieve the desired objective of increased stability. As of this time, no completely satisfactory alternative of that nature has been developed. Accordingly, upon reconsideration of all of the factors relating to the airport program, the Administration would support, in this particular case, the general principle of advance contract authority, within reasonable limitations as to duration and amount."

Traffic Growth Factors

He opposed the four-year program, though, on the grounds that the appropriate level of federal aid cannot be determined that far in advance, because of these two factors: "on the one hand, air traffic growth and new technical developments will tend to increase the over-all level of airport improvement required throughout the country. On the other hand, this same traffic growth should improve the financial results of airport operations, and may therefore make airport operators relatively less dependent upon federal participation.

Rothschild also objected to these two provisions of the Senate-passed bill:

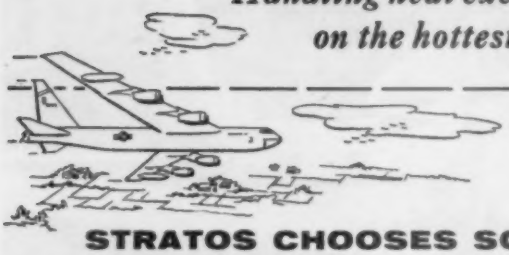
- **First,** that all types of airports be eligible for aid. This provision is directed at the criteria established by Commerce Department (30 based aircraft or a minimum of 3,000 enplanings annually), under which the number of projects eligible for aid was reduced from 5,000 to 2,235. Rothschild maintained that Commerce Department must have discretionary authority to determine eligibility if airport development is to be according to a "national" plan.
- **Second,** that federal aid be available for terminal facilities.

These should have a low priority on federal funds, and it should be discretionary with the Commerce Department whether to make grants, Rothschild maintained. He pointed out that "truck and bus terminals and steamship piers are surely just as essential to the efficient operation of these other carriers, as airport terminal buildings are for air transportation. But the federal government, while participating in the construction of highways and in the improvement of rivers and harbors, does not accept responsibility for the development of the necessary terminal facilities in those fields."

Lufthansa Buys C-47

Lufthansa has purchased a third Douglas C-47 in France for conversion to passenger operations, supplementing its four Convairs. A C-47 used by Lufthansa as a crew trainer is also expected to be converted later for passenger service.

Handling heat exchange problems on the hottest jobs in the air!



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Absolute dependability is a must when it comes to controlling temperature on today's high speed aircraft. That's why the Stratos Division of Fairchild Engine and Airplane Corporation chose South Wind Model 949-A air-to-air heat Exchanger for use in their EA-75 Air Cycle Refrigeration System for the Boeing B-52.

This unit is a tube bundle air-to-air exchanger, just one of the many models being produced by South Wind to meet any heat exchanger need.

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Stratos Division Model EA-75 Air Cycle Refrigeration System.

South Wind Model 949-A consists of two separate heat exchangers—ram and blower—to achieve maximum heat rejection per pound of material used. Both exchangers employ the thin wall, dimpled stainless steel tube bundle construction. This construction obtains maximum heat transfer area with minimum pressure drop.

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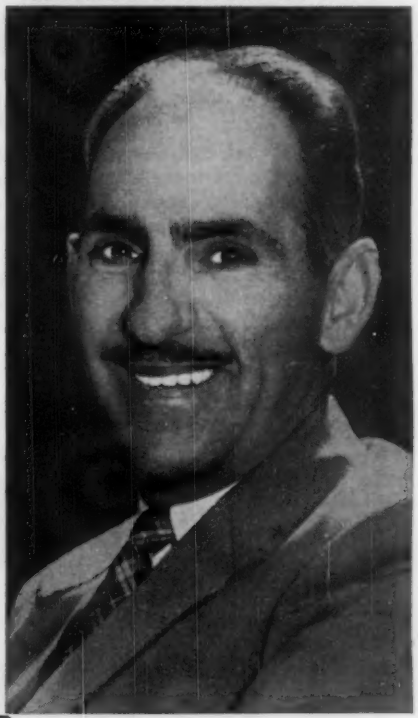

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GULF OIL CORPORATION
GULF REFINING COMPANY

Airline Traffic—May 1955

	Revenue Passengers	Revenue Passenger-Miles (000)	Revenue Passenger Load Factor	U. S. Mail Ton-Miles	Express Ton-Miles	Freight Ton-Miles	Total Revenue Ton-Miles	Per Cent Revenue to Available Ton-Miles
DOMESTIC TRUNK								
American Airlines	643,402	362,565	**66.19**	1,510,500	826,216	5,143,754	42,104,108	**57.83**
Braniff Airways	144,857	53,266	**62.14**	154,527	103,934	331,135	5,688,605	**55.83**
Capital Airlines	225,754	70,073	**56.84**	277,480	205,018	299,331	7,479,386	**42.06**
Colonial Airlines	38,324	9,520	**53.92**	13,307	6,397	29,165	933,910	**49.33**
Continental Airlines	55,008	19,689	**54.59**	60,486	25,383	125,016	2,095,911	**47.00**
Delta—C & S Air Lines	181,555	80,735	**67.72**	257,308	202,528	565,276	8,768,499	**62.03**
Eastern Air Lines	548,772	258,492	**61.68**	818,701	430,801	1,050,327	28,450,134	**49.48**
National Airlines	90,893	60,519	**65.17**	228,612	46,710	357,867	6,785,626	**65.54**
Northeast Airlines	46,021	9,166	**57.82**	10,893	13,421	33,316	885,657	**55.87**
Northwest Airlines	109,874	71,061	**52.41**	369,210	201,637	587,117	8,041,947	**47.03**
Trans World Airlines	328,476	236,543	**65.76**	1,070,428	614,579	1,921,827	26,261,574	**60.66**
United Air Lines	476,594	321,701	**65.97**	1,993,678	947,635	3,450,274	37,272,947	**57.40**
Western Air Lines	91,364	40,965	**56.59**	210,663	67,245	230,681	4,420,336	**53.11**
LOCAL SERVICE								
Allegheny Airlines	30,385	4,811	**48.83**	6,573	14,351	.....	479,794	**48.70**
Bonanza Air Lines	8,675	1,879	**39.08**	3,198	1,867	5,692	190,444	**37.97**
Central Airlines	8,413	1,315	**27.77**	3,870	1,499	4,755	135,979	**25.13**
Frontier Airlines	14,867	3,867	**43.28**	14,035	7,417	64,840	455,717	**53.55**
Lake Central Airlines	10,274	1,577	**36.84**	2,555	9,287	.....	154,477	**33.50**
Mohawk Airlines	23,332	4,152	**61.66**	4,365	5,317	6,902	411,999	**61.18**
North Central Airlines	37,996	5,945	**49.92**	18,217	21,854	.....	602,664	**44.50**
Ozark Air Lines	22,403	3,397	**38.76**	6,324	11,204	.....	334,997	**38.76**
Piedmont Airlines	33,446	6,374	**53.50**	7,551	9,876	13,753	640,889	**52.80**
Pioneer Airlines	.....	.....	.....	.....	.....	.....	.....	.....
Southern Airways	16,061	2,701	**46.01**	8,668	11,349	.....	278,468	**43.77**
Southwest Airways	23,486	4,466	**54.09**	6,445	4,365	13,037	449,459	**53.44**
Trans-Texas Airways	13,890	3,137	**39.68**	11,729	6,037	15,049	331,643	**36.70**
West Coast Airlines	19,727	3,114	**43.18**	3,902	2,152	8,473	294,579	**46.24**
INTERNATIONAL								
Braniff Airways	3,060	6,790	**45.28**	28,608	.....	89,173	883,608	**46.23**
Delta—C & S Air Lines	3,821	4,620	**45.47**	6,709	.....	59,302	541,453	**38.72**
Eastern Air Lines	14,230	20,046	**62.64**	56,014	.....	100,429	2,276,889	**56.18**
Northwest Airlines	7,825	15,388	**50.04**	771,235	10,189	573,336	2,986,459	**60.31**
Pan American World Airways								
Alaska	6,923	9,454	**61.10**	32,392	.....	311,865	1,272,141	**49.92**
Atlantic	73,248	90,777	**65.47**	825,796	.....	1,660,757	11,984,417	**65.97**
Latin America	74,685	74,012	**59.63**	336,462	.....	2,531,267	10,091,286	**58.11**
Pacific	17,920	57,644	**66.98**	1,292,787	.....	1,055,701	8,375,272	**65.52**
Pan American-Grace Airways	10,849	13,103	**58.34**	40,839	.....	204,362	1,658,679	**54.83**
Trans World Airlines	22,595	58,573	**70.21**	672,918	653,366	95,537	7,503,337	**72.18**
HAWAIIAN CARRIERS								
Hawaiian Airlines	29,972	3,973	**59.33**	4,205	.....	129,724	473,892	**53.15**
Trans-Pacific Airlines	14,098	1,832	**49.63**	986	28	8,726	154,714	**50.53**
CARGO LINES								
Flying Tiger Line	1,123	1,773	**87.04**	.....	.....	3,498,238	3,675,511	**68.63**
Riddle Airlines	.....	.....	.....	.....	.....	1,052,264	1,052,264	.....
Slick Airways	128	168	**26.79**	.....	.....	4,022,694	4,085,370	**70.96**

Compiled by **AVIATION WEEK** *from airline reports to Civil Aeronautics Board.*

DC-3 Pilot Blamed in Collision

The pilot of an executive DC-3 which collided with a Trans World Airlines Martin 2-0-2A has been blamed for the accident by the Civil Aeronautics Board.

CAB found that the probable cause of the accident, which occurred near Cincinnati, Ohio, Jan. 12, 1955, was operation of the DC-3 in the Cincinnati control zone as unknown traffic, without clearance, near the base of, or in the overcast.

The collision occurred about two minutes after takeoff of the TWA Martin from Greater Cincinnati Airport.

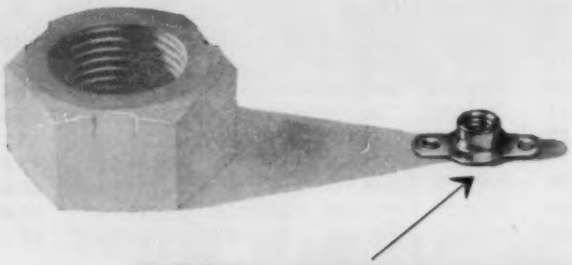
The DC-3, owned by Castleton, Inc., was flying without flight plan from Battle Creek, Mich., to Lexington, Ky., and was not known to be in the area by the Cincinnati tower. The two collided, killing both crews and all ten passengers aboard the TWA flight.

The CAB report stated that the DC-3 pilot had been briefed on weather conditions at Battle Creek and knew weather would become marginal along the route. "Since the flight was conducted without flight plan, in weather conditions which became poorer, and without communicating with any station enroute, it is considered that he failed to exercise reasonable judgment and conducted this operation contrary to good operating practices," the report said.

"Good judgment would have dictated, in light of the weather situation, that the flight should have been planned and conducted so as to avoid flying at low altitudes in marginal VFR conditions.

"The DC-3 was operating in the control zone without being cleared to do so by air traffic control. Since the ceiling was less than 1,000 feet, this clearance was required.

"The DC-3 was equipped with several transmitters and receivers. It is therefore considered remote that total radio failure could have occurred," CAB stated.



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Prop Pitch Indicator Deadline Extended

Extension of the deadline for installation of propeller reverse pitch indicators has been proposed by the Bureau of Safety Regulation of the Civil Aeronautics Board.

In October, 1954, the Bureau of Safety Regulation ordered installation of a device on aircraft with reversible pitch propellers which indicates to the pilot when the propeller is in reverse pitch.

The installation was to have been completed Sept. 1, 1955, but seven airlines have been found unable to meet the deadline.

A Civil Aeronautics Administration survey indicates installation can be completed by Apr. 1, 1956, and BSR favors extension of the deadline to that date.

CAB ORDERS

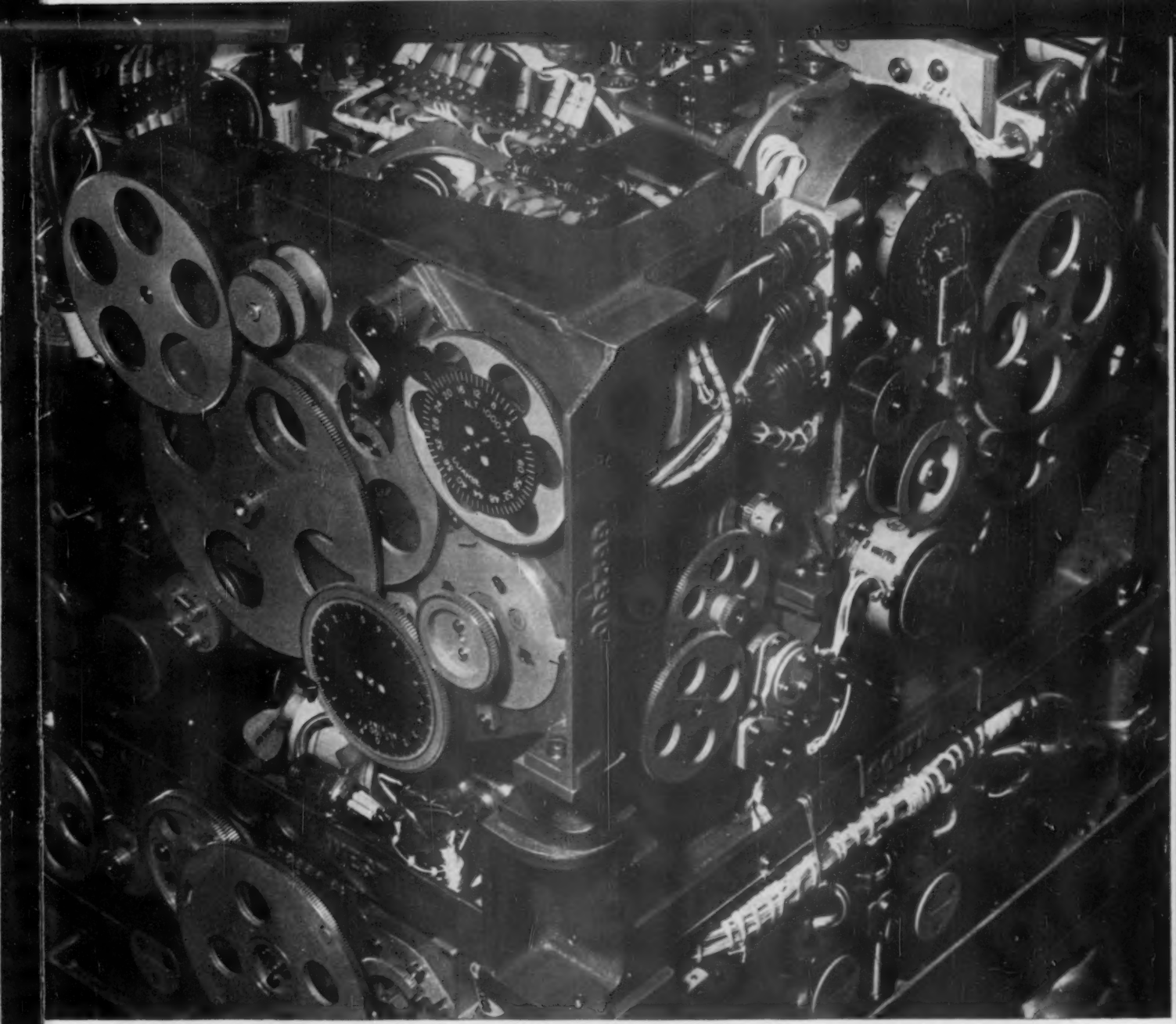
(June 30 to July 6)

GRANTED:

United Air Lines permission to serve Ely, Nevada, through Yelland Field.

Capital Airlines an exemption to permit sale of three DC-4A aircraft to Los Angeles Air Service and three DC-4B aircraft to Riddle Airlines and to permit temporary lease-back to Capital of the three Riddle aircraft and two of the Los Angeles Air Service aircraft.

Mohawk Airlines a temporary exemption to operate direct service between Ithaca, N. Y. and Albany, N. Y. for two years, provided all flights between Buffalo



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'C&O for Progress'

Chesapeake & Ohio Railway has taken to the air.

The railroad last week leased a DC-3 from Capital Airlines for a year. C&O President Walter J. Touhy said it "will enable our officers to cover more efficiently more than 5,000 miles of railroad operations extending from Washington, D. C., and Virginia to Cincinnati, Chicago, Michigan, Wisconsin and Canada."

The plane is being fitted with desk, typewriter and other equipment to make it an aerial version of the railway office car. It will be painted blue and yellow, the C&O colors, and the nose will carry the line's insigne: "C&O for Progress."

Toughy added: "C&O officers will travel by train as now, when that is the best way to go."

or Rochester and Albany stop at two intermediate points.

ORDERED:

Eastern Air Lines' certificate amended to remove the restriction which prevents service to Florence, S. C. and Columbia, S. C. on the same flight.

Braniff Airways' temporary mail rate fixed at 36.29 cents for international operations and at the domestic trunkline service rate for domestic operations. Both rates apply to period starting January 1.

United Airlines authorized to suspend service at Elko, Nevada, from July 6 to August 19, 1955 during runway resurfacing at Elko Municipal Airport.

Wien Alaska Airlines' mail rate reopened as of July 1, 1955, and Wien is ordered to show cause why the Board shouldn't set temporary mail rates for the carrier of 116.96 cents for the period July 1, 1955 to October 31, 1955; 178.35 cents for November 1, 1955 to April 30, 1956 and the like six month period in each succeeding year; and 116.96 cents for May 1, 1956 to October 31, 1956 and the like six month period in each succeeding year.

Cordova Airlines' mail rate reopened as of July 1, 1955 and Cordova is ordered to show cause why the Board should not set temporary mail rates for the carrier of 108.17 cents for the period July 1, 1955 to October 31, 1955; 230.92 cents for November 1, 1955 to April 30, 1956 and the like six-month period in each succeeding year; and 108.17 cents for May 1, 1956 to October 31, 1956 and the like six-month period in each succeeding year.

Caribbean-Atlantic Airlines' mail rate be reopened as of July 1, 1955 and Caribbean is ordered to show cause why the Board should not set a temporary mail rate for the carrier of $1.38 per ton-mile.

DISMISSED:

Overseas National Airways' petition to reopen the record in the Trans-Atlantic Cargo Case and its motion for expeditious decision and allocation, of aircraft, in view of the President's recent approval of the CAB decision to certificate Seaboard and Western Airlines.

Northwest Airlines' application for continuation of temporary authority to serve Pusan, Korea, since the President and the CAB have subsequently approved the service in the Trans-Pacific route case.

DENIED:

Mohawk Airlines' application for an exemption to serve Glen Falls, N. Y.

Colonial Airlines' petition for reconsideration of a CAB order denying Colonial an exemption to operate between Glens Falls, N. Y. and Syracuse.

North Central Airlines' application for an exemption to operate between Detroit and Erie, Pa.

SHORTLINES

► **Air India International** has added a weekly "Flying Rani" luxury service to its London-Bombay route, and another extra flight has been added between London and Bombay via Dusseldorf, Zurich and Beirut.

► **Alleghany Airlines** flew 5,990,000 passenger-miles in June, an increase of 49% over the previous June. The carrier flew 23.7 million passenger-miles in the first six months of 1955, a 35% increase over the first half of 1954.

► **Hunting-Clan Air Transport,** English carrier, inaugurates all-cargo service between the United Kingdom and Africa July 23. A subsidiary company, Hunting-Clan African Airways, has been set up to develop local air cargo traffic in Central Africa.

► **North Central Airlines** claims an industry record of 43,872 passengers carried in June. Passenger traffic increased 53% over June 1954.

► **Slick Airways** began carrying surface mail June 29 with a flight from Chicago to Washington. The cargo line has scheduled 10 flights a week between Chicago and Washington and Chicago and New York, carrying both mail and freight . . . Slick has signed a $9-million four-year contract with Shell Oil Co. for aviation gas.

► **Pan American-Grace Airways** will inaugurate deluxe service to South America Aug. 1 with new DC-7Bs. The new Panagra aircraft are equipped with weather radar and will be scheduled for 16¼ hr. between Miami and Buenos Aires.

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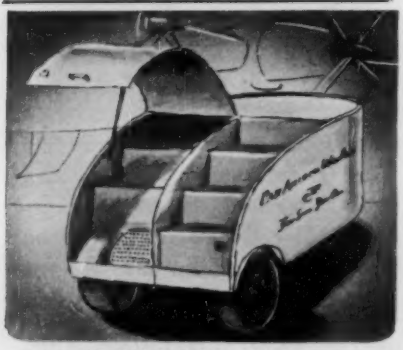

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The 'Minimum' Myth

The condition known as "all weather flight" has been eagerly sought for many a long year—it has almost become a part of aeronautical mythology. One of the fanciest fables in connection with the subject might be called the "Myth of Geometric Progression."

This refers of course, to the continued drop in landing minimums in nice, neat, mathematical order from 400 foot ceilings and one mile visibility down to 300 and ¾, more recently to 200 and ½ and the oft heard desire for 100 and ¼.

It all sounds so clean and simple. Just as if it were practically possible. And indeed it might be—just might—if the tools required for the job would get better by the same progression.

Instruments Not Precise Enough

But this is not the case. Pilots are being asked to do an infinitely more precise job with the same old—and in some cases worse—inaccurate appliances. The reference is of course, to the prime ingredient of the instrument approach—the instruments themselves.

The craze for precise measurement has invaded every inch of American technology and has made possible some astounding progress. From Palomars probing faraway galaxies we range down to the universe of the atom via the electron microscope. A fifty-thousandth of an inch and a millionth of a second are commonplace yardstick measurements today.

Despite this modern "hair splitting," pilots in the cockpit must continally arrive at solutions with an accuracy greater than their tools can measure. Can this be called modern science?

The problem boils down to the fact that there is no adequate set of specifications for instrument approaches. The Civil Air Regulations list some required items (and some airlines add to this) but the realm of needed operational accuracy is entirely avoided.

Some columns back (AW Mar. 7, p. 64), the need for precise direction indication was mentioned. Nowhere is this more important than on a low approach. But nobody specifies WHAT accuracy is needed for each succeedingly lower minimum. An ordinary compass might suffice down to 500 feet or so but it certainly is not stable enough to go to 300 feet. Well, what stability is needed, how many degrees error and how much lag can be allowed at each altitude?

The altimeter is known to suffer from hysteresis and to lag horribly during fast descents of modern pressurized aircraft. There has been no substantial improvement in this gadget for years but the minimums have dropped constantly. At 200 feet there just ain't room for much error.

Today's artificial horizon is almost as bad. Some airlines use instruments which are not even designed to show level flight after a bank in much less than 20 minutes. Try that one at 200 and ½!

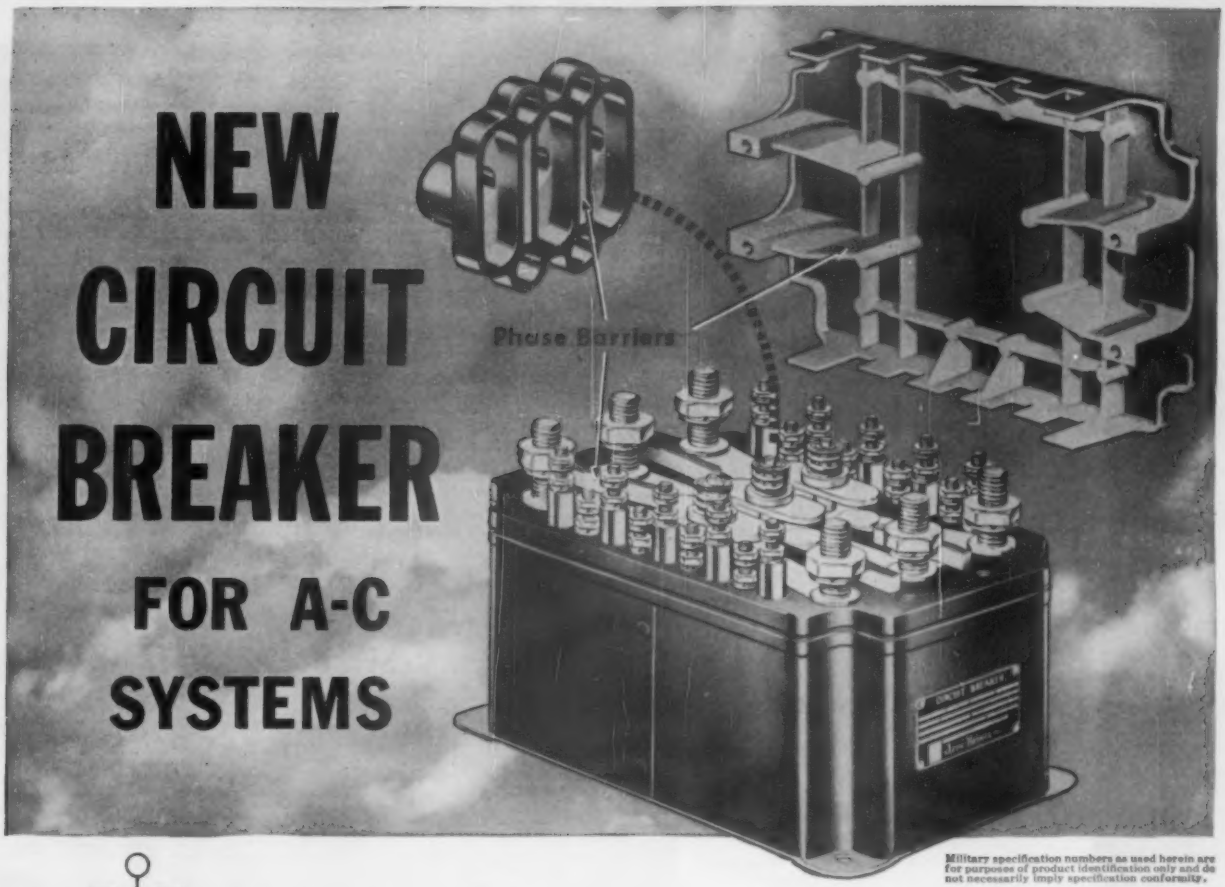
For Better Instrument Approaches

To be sure, other things must also be considered in the subject of instrument approaches.

For instance, aircraft stability, landing speeds, crew training and coordination, navigation facilities, "go around" characteristics of the aircraft, runway length and obstructions, and naturally the all-important visual aids (including the you-know-what extending nearly a mile from the runway centerline) and many other things are vital factors.

But it doesn't seem that a complete set of standards is needed. This would give the industry something real to work from. It might even be entitled "A Handy Guide to Instrument Approaches."

NEW CIRCUIT BREAKER FOR A-C SYSTEMS



Military specification numbers as used herein are for purposes of product identification only and do not necessarily imply specification conformity.

Design features provide exceptional safety and ease of maintenance

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  Straight-through path design of main conductors together with phase barriers permits complete mechanical phase isolation of all main conductors and contacts.

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EDITORIAL

Research Must Keep Good People

There are many encouraging signs in Washington this summer that the White House, the Pentagon and the Congress are recognizing the vital role of basic research as a foundation for the development, production and operation of superior aerial weapons. The expansion and acceleration of USAF research program through its Office of Scientific Research (see page 12) is another significant step in this direction.

However, the successful operation of military research and development programs requires an adequate number of technically qualified officers to maintain intelligent liaison with the civilian scientific community and private industry. During the last five years there has been a steady drain of this type officer from the services into private industry—some lured by higher pay and better opportunity and some prodded solely by disgust with the lot of the technically specialized officer in the military services.

Excerpts from the following letter received from a technically well-educated, rated pilot who served in materiel, and research and development posts for many years and who is well known to the staff of AVIATION WEEK sheds some light on this problem.

"Congratulations on your recent editorials about Russian air development. I refer particularly to the last paragraph of your editorial of June 6, on the need for 're-vitalization' of USAF and Navy programs.

"It was because of this lack of vitalization that a number of contemporaries and myself recently resigned our regular USAF commissions. Many, like myself, had post-graduate degrees in aeronautical engineering but just could not cope with the WPA type of management at AMC and ARDC. I left the regular Air Force after fifteen years of service and took a job paying less simply because of complete professional frustration.

"I am not so vain as to imagine that my departure was an aeronautical event but it may be useful to your cause to get a list of those technically trained officers that have left the regular USAF from Horace Shepherd to the present. There you will find the cadre of intelligence and vitality that the USAF now needs in its technical race with the Soviet Air Force.

"Then you might ask those general officers who, over the past ten years, were supposed to supply the inspiration and leadership that would have captured the enthusiasm and respect of this lost battalion, to render an account of their negligent stewardships.

"In any case, keep up the good work."

This is a serious problem for the Air Force and Naval aviation leaders as they accelerate and expand their research effort to keep well ahead of their Russian challengers. Many of the top level research and development officials are acutely aware of this problem and are working hard to make a technically specialized career more attractive in the services. In the past the technical military specialist has suffered professionally in comparison to the "jack of all trades" type of line officer that got the steady promotions and the top commands. A good example of the effort being generated by some segments of USAF to provide recognition for younger, technically trained specialists is the picture reproduced here of Lt. Col. Vincent T. Ford being awarded a Legion of Merit by USAF Under Secretary James Douglas. "Vince" Ford, a combat veteran of World War II, is typical of the younger generation of USAF officers who have acquired a fine technical background and who have been working effectively in research and development since World War II.

The Legion of Merit award was in recognition of his work on the Atlas intercontinental missile project: as executive to the Technological Capabilities Panel of the Scientific Advisory Committee to the President of the United States; and as executive to USAF's special assistant for research and development. It is encouraging to see younger technical specialists such as "Vince" Ford receive official recognition from the Air Force. But this type of recognition is only a beginning toward solution of the grave problem of keeping good, technically qualified specialists in USAF and the Navy as career officers.

—Robert Hotz

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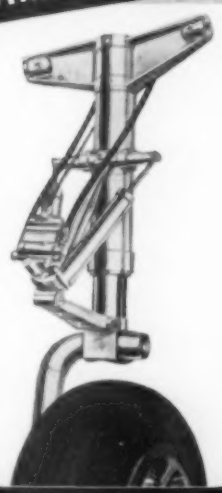

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